AN EXPANSION PATH OF LONG-RUN ADJUSTMENTS OF CITRUS PACKING HOUSES IN CENTRAL CALIFORNIA

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A DISSERTATION PRESENTED TO THE GRADUATE COUNCIL OF
THE UNIVERSITY OF FLORIDA
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE
DEGREE OF DOCTOR OF PHILOSOPHY

UNIVERSITY OF FLORIDA
August, 1965

ACKNOWLEDGMENTS

The author is appreciative of the contributions made toward the completion of this dissertation. Credit is due to many individuals. To Dr. C. N. Smith, Department of Agricultural Economics, University of Florida, the writer expresses his deep gratitude for his guidance in the planning and formulation of research tools used in this study. The author is indebted to Drs. D. L. Brooke and M. R. Langham of the Department of Agricultural Economics; Dr. Louis W. Ziegler, Department of Fruit Crops; and Dr. R. H. Blodgett, Department of Economics (all of the University of Florida) for their valuable suggestions on the construction and content of this dissertation.

A great debt is owed to Dr. Eric Thor, Giannini Foundation of Agricultural Economics, University of California, Berkeley, who, as a friend, contributed much encouragement and counsel in the development of this dissertation. Appreciation is also expressed to Dr. Thomas M. Little, Biometrician, and Mr. Robert G. Platt, Subtropical Horticulturist, University of California, Riverside, for their worthy assistance and advice.

For their generous cooperation in providing data used in this dissertation, special recognition is due to the managers of packing houses in Central California, Mr. Maurice Johnson and staff, Research and Engineering Division, and Mr. Felton Browning and staff, Grower Relations and Membership Department of Sunkist Growers, Inc. are due a debt of gratitude for their assistance.

Many thanks are due to Mrs. Helen Streeter and Mrs. Helen Hayes for statistical and secretarial work and to Charlotte Isbill who typed the final manuscript.

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CHAPTER I

INTRODUCTION

The Role of Citrus in California Agriculture

Oranges are the most important food crop produced for fresh market in California. During the ten-year period 1950 to 1960 the total farm value of orange production in California averaged 99 million dollars annually. With the exception of grapes as a commodity group, the average annual value of all oranges exceeded the value of any fruit, nut, or vegetable crop produced in California. The farm value of the 1962-63 California orange crop was approximately 117 million dollars.[1]

The total production of all citrus in California during the 1962-63 season amounted to 43,700,000 equivalent packed boxes, with a farm value of $170,656,000. This production was harvested from 185,002 acres and consisted of 16,200,000 boxes of Valencia oranges; 12,600,000 boxes of navel and miscellaneous oranges; 12,400,000 boxes of lemons; and 2,500,000 boxes of grapefruit. During the period 1951 to 1960 the cash farm income of all citrus grown in California averaged $143,133,000 annually, and accounted for 5.1 per cent of the total cash farm income of the state.

In addition to the incomes received by growers, fresh fruit packing houses paid substantial sums for the factors of production utilized in their operations. During the 1962-63 season, on the basis of an average crop year, the industry cost of picking, handling, and packing oranges in Central California was approximately 21 million dollars.[2] These costs included 5.4 million dollars for picking, 1.0 million dollars for hauling fruit from the orchard to the packing house, and 14.7 million dollars for the packing operation.

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[1] Basic data obtained from the California Crop and Livestock Reporting Service, California Department of Agricultura, Sacramento, California.

The Problem

Central California, defined in this study as the California counties of Kern, Tulare, Fresno, and Madera, is a district of expanding orange acreage and production. The trend in this district is in contrast to that of Southern California where orange acreage is declining. Since 1950 Central California has advanced from a position of providing 19 per cent of the total California orange acreage to 36 per cent of the total in 1962. This shift in production will significantly affect the cost of assembling and packing oranges for market. In Southern California a consolidation of packing houses will be necessary if costs are to be minimized. In Central California and the desert areas in California and Arizona an expansion of packing house facilities will be needed to handle the increased volume of orange production.

The problem facing the orange industry in Central California is one of planning the expansion of packing house facilities which will adequately handle increased volume at minimum assembly and packing cost. Approached on a district basis, this planning problem involves consideration of presently existing and projected orange packing houses, both individually and collectively.

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[2] Derived from data contained in Picking, Hauling and Packing Costs for California-Arizona Citrus, 1962-63 Season (Los Angeles: California Citrus League, April, 1964).

Purpose of Study

The purpose of this study was to develop a long-run adjustment plan for orange packing house facilities in the Central California production district. The specific objective was to develop a plan in terms of the number, size, and location of Central California orange packing houses during the ten-year period, 1962-63 to 1972-73, which would approach the least-cost expansion path of total assembly and packing cost.

The theoretical solution to the problem of the optimum number, size, and location of packing houses required to handle the projected orange production in Central California in 1972-73 was developed by Siebert.[3] Siebert's study was based on the assumption that the industry would build all new packing houses in 1972-73 to handle the 38 million boxes of oranges projected for the district in that season. The present dissertation is concerned with industry adjustments in a real world sense as the industry adjusts from the number, size, and location of existing packing house facilities in the base-year 1962-63 toward the future optimum solution in 1972-73.

Scope of Dissertation

This dissertation is a study in district facilities planning which develops the least-cost expansion path among feasible alternative plans for orange packing houses in Central California during the period 1962-63 to 1972-73.

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[3] Jerome B. Siebert, "Long Range Adjustment of Orange Packing Houses in Central California: A Consideration of the Optimum Number, Size, and Location of Packing Facilities" (unpublished Ph.D. dissertation, University of California, Berkeley, 1964).

The term "least-cost expansion path" was used in this study to indicate the least-cost expansion path among the alternative plans analyzed and not the least-cost expansion path of all possible alternatives. Undoubtedly there are a multitude of alternative plans which could be considered; some perhaps may have lower costs than the least-cost expansion path indicated in this study. However, due to the limitations imposed by the method of analysis, the alternative plans were limited to those considered operationally feasible. In a real world situation it seems reasonable to assume that the least-cost expansion path developed by this analysis closely approaches the actual least-cost path.

This study was based on three sets of data developed from field studies of orange packing houses in Central California and other industry sources. The three sets of data were:

1. Projected expansion paths of orange production by 12 areas in Central California during the ten-year planning period.
2. Three feasible alternative expansion plans for packing house facilities for each area. Expansion plans considered included the consolidation of small and obsolete packing houses into large modern facilities, and the building and locating of new facilities to handle increased volume.
3. Cost and operational data for existing and new packing house facilities in Central California.

These sets of data were combined by using a modified budgetary approach to calculate total assembly and packing costs. Costs were calculated for a ten-year planning period for selected alternative expansion plans. A total of 36 plans representing three alternatives for each of the 12 areas in Central California were considered. Cost calculations gave consideration to both the fixed and variable costs of the 47 existing packing houses located in Central California and of the proposed new and expanded packing houses. In addition, adjustments were made in factor prices to reflect anticipated inflationary increases in the cost of labor, equipment, and material during the planning period.

For each of the 12 areas the least-cost plan was determined and aggregated to obtain the least-cost expansion path for Central California; costs over the ten-year planning period were discounted to base-year values. This least-cost expansion path was analyzed to determine the number, size, and location of orange packing houses represented.

CHAPTER II

SOME CHARACTERISTICS OF THE CALIFORNIA ORANGE INDUSTRY AND PACKING HOUSE OPERATIONS

A description of some of the production and marketing characteristics of the California orange industry, with particular emphasis on the harvesting and packing operations in the Central California district, is essential to the understanding of the problem and solution of long-run adjustments in packing house facilities.

The orange industry in California and Arizona can conveniently be divided into three major production districts.[1] The three districts are outlined in Figure 1 and are defined as follows:

Area 1: Central California, which includes the counties of Kern, Tulare, Fresno, and Madera in the San Joaquin Valley of California.

Area 2: Southern California, which includes the counties of Santa Barbara, Ventura, Los Angeles, Orange, San Diego, San Bernardino, and Riverside County west of San Jacinto Peak.

Area 3: Arizona-Desert-Valley, which includes all districts in Arizona, with the California counties of Imperial and that portion of Riverside County east of San Jacinto Peak.

Two minor production districts should be noted. One is referred to as Northern California and is located in Glenn and Butte counties in the Sacramento Valley close to the city of Chico as indicated in Figure 1.

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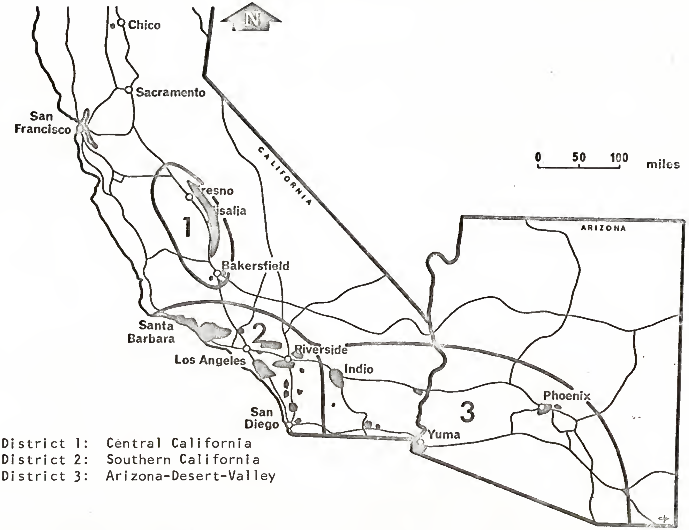
[1] It is logical to include the orange production in the adjoining state of Arizona in a discussion of the California industry. To simplify wording, however, the reference to the California industry in this chapter will include Arizona districts.



District 1: Central California
District 2: Southern California
District 3: Arizona-Desert-Valley

Figure 1. Citrus Production Districts in California and Arizona

Plantings are principally of the navel variety and total acreage amounts to a little over 2,000 acres. The district is not included in the Federal marketing program which regulates California orange marketings. Because of the relatively small volume of production in this district, it will not be considered further in this chapter.

A second minor production district, designated as District 4--Edison by the Navel Orange Administrative Committee, is located in Kern County in the Southern San Joaquin Valley close to the City of Bakersfield as indicated in Figure 1.[2] Plantings are principally of the navel variety and harvested acreage amounts to approximately 800 acres. Because the Edison District lies within the confines of Central California, defined previously as District I, statistical information in this chapter pertaining to this district is included in data for Central California.

Acreage and Production Trends

Significant shifts in acreage and production have taken place between the three major orange production districts in California and Arizona.[3] Acreage and production is increasing in Central California and decreasing in Southern California. The major reasons for declining acreage in Southern California are the impact of urbanization on citrus land

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[2] District 4--Edison is included here to clarify a minor production district commonly recognized by the industry.

[3] Robert C. Rock and R. G. Platt, Economic Trends in the California Orange Industry, 1964, Agricultural Extension Service (Riverside: University of California, September, 1964).

and the damaging effect of the citrus virus disease, tristeza, or "quick decline."[4,5]

For example, in 1950 total harvested orange acreage in California and Arizona, excluding the Northern California district, was 223,898 acres. Of this total 174,456 acres, or 78 per cent, were located in Southern California. By 1962, in a period of 12 years, total harvested acreage in Southern California had decreased to 84,661 acres, or 57 per cent of the state total harvested acreage.

A portion of the decreased orange acreage in Southern California has been and will continue to be replaced by plantings in Central California. Many displaced citrus growers from the Southern California district have been attracted to Central California by lower land cost, lower water cost, and suitable climatic conditions for orange production. Total harvested acreage in Central California increased from 41,826 acres in 1950 to 52,863 acres in 1962. In addition to harvested acreage in 1962, there were 22,312 acres of non-bearing oranges in the area. The

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[4] The combined population of the seven Southern California counties doubled between 1950 and 1963. Population estimates by the California Department of Finance show an increase in population for the seven Southern California counties of Los Angeles, San Diego, San Bernardino, Orange, Riverside, Ventura, and Santa Barbara from 5,618,600 in 1950 to 10,153,700 in 1963. Of this group, the two counties of Los Angeles and Orange experienced a growth in population from 4,388,300 to 7,559,500 during the period.

[5] The virus disease, tristeza, has been a major threat to citrus in Southern California for a number of years. It has spread through Los Angeles, Orange, Ventura, and the western portion of Riverside and San Bernardino Counties. Recently it has been detected in San Diego County and in isolated orchards in Central California. The virus causes severe damage to sweet orange and mandarin trees on sour orange rootstock. In recent years thousands of orange trees have been killed or rendered unproductive annually in Southern California.

geographic distribution of orange acreage in Central California is shown in Figure 2.

These shifts in acreage represent an important change in the time of harvest for both navel and Valencia oranges. Maturity is earlier in Central California; this means that in the future a larger portion of the state's orange crop will be ready for marketing earlier than in past seasons. Also, the recent heavy plantings of navel oranges in Central California have resulted in a higher proportion of the state's total orange acreage being of the navel variety than in past periods.

Projections of future orange production developed by Thor and Siebert indicate a rising trend.[6] A summary of these projections by variety and district for the period 1963-64 to 1972-73 is shown in Table 1. Total California average annual production of navel and Valencia oranges was projected to rise from 50,069,000 field boxes in 1963-64 to 68,490,000 field boxes in 1972-73. Expected production of navel and Valencia oranges in Central California was estimated to rise from 19,356,000 field boxes in 1963-64 to 38,135,000 field boxes in 1972-73. During the same period production in Southern California was estimated to decline from 27,023,000 field boxes to 17,671,000 field boxes, and production in the Arizona-Desert-Valley area was estimated to rise from 3,690,000 field boxes to 12,684,000 field boxes.

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[6] For a detailed discussion of these projections see Eric Thor and Jerome B. Siebert, Projection of Acreage, Yield per Acre and Normal Orange Production in Central California (Berkeley: Giannini Foundation of Agricultural Economics, Agricultural Extension Service, 1962).

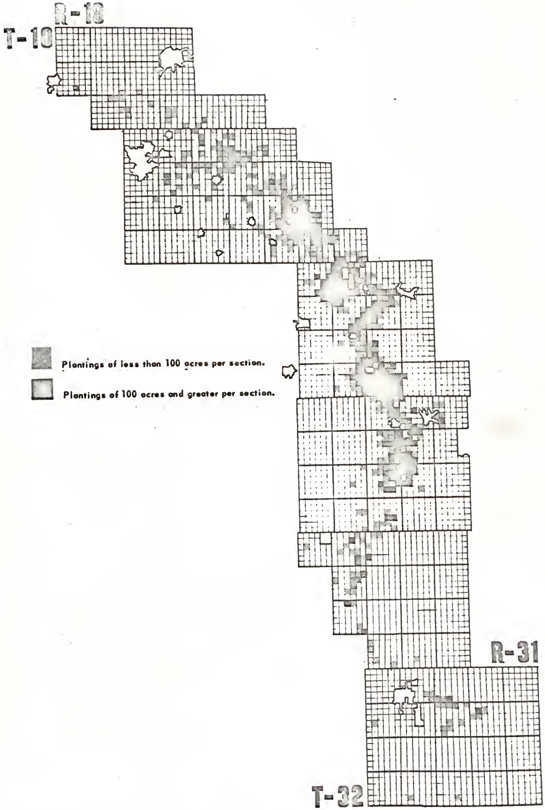
R-18
T-10
▨ Plantings of less than 100 acres per section.
▢ Plantings of 100 acres and greater per section.
R-31
T-32

Figure 2. Central California Orange Plantings, 1962

TABLE 1. PROJECTED TOTAL NAVEL AND VALENCIA ORANGE PRODUCTION FOR CENTRAL CALIFORNIA, SOUTHERN CALIFORNIA, AND CALIFORNIA-ARIZONA-DESERT-VALLEY DISTRICTS, 1963-64 TO 1972-73

Year	Navel Production District[a] Central	 Southern	 Desert	 Total	Valencia Production District[a] Central	 Southern	 Desert	 Total
		thousands of field boxes				thousands of field boxes		
1963-64	13,984	7,026	514	21,524	5,372	19,997	3,176	28,545
1964-65	15,099	6,641	599	22,339	6,275	19,137	4,139	29,551
1965-66	16,421	6,256	640	23,317	7,284	18,190	5,294	30,768
1966-67	17,749	5,871	690	24,310	8,237	17,270	6,545	32,052
1967-68	19,092	5,486	740	25,318	9,200	16,376	7,700	33,276
1968-69	20,408	5,101	775	26,284	10,148	15,507	8,566	34,221
1969-70	21,685	4,813	810	27,308	11,056	14,767	9,144	34,967
1970-71	22,815	4,620	850	28,285	11,901	13,943	9,914	35,758
1971-72	23,819	4,550	900	29,629	12,634	13,552	10,780	36,966
1972-73	24,846	4,500	941	30,287	13,289	13,171	11,743	38,203

[a] Districts defined by Orange Administrative Committee, Los Angeles, California.

Source: Eric Thor and Jerome B. Siebert, Projection of Acreage, Yield per Acre and Normal Orange Production in Central California (Berkeley: Giannini Foundation of Agricultural Economics, Agricultural Extension Service, 1962).

The trends in acreage harvested and production from 1945 to 1963 by varities for Central California, Southern California, and the Arizona-Desert-Valley districts are summarized in Tables 2, 3, and 4.

Seasonal Variation of Orange Production in Central California

Packing house operations and costs are directly affected by the seasonal pattern of production and harvesting. In Central California the harvest of the new orange crop usually begins in early November and continues through July of the following year. During the summer and fall months of August through October supplies are negligible, and practically all orange packing houses in the district close.

Two varieties provide supplies during the November through July packing season. Navel orange harvest usually begins the first of November, peaks in December, and then, after a post-holiday dip and recovery, steadily declines to the end of the harvest in May. Valencia orange harvest usually begins by the end of March, peaks in May, and then declines rapidly during June and July. The average pattern of weekly shipments of navel and Valencia oranges is shown in Figure 3.

The seasonal pattern of orange harvest in Central California is modified somewhat by the operations of two Federal Marketing Orders.[7] These marketing order programs are administered by the Navel and Valencia Orange Administrative Committees under the authority of the Secretary of Agriculture. The main features of the two orders are quality and quantity

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[7] Navel oranges are currently regulated under Federal Marketing Agreement No. 117 and Order No. 907. Valencia oranges are currently regulated under Federal Marketing Agreement No. 131 and Order No. 908.

TABLE 2. TREND IN ACREAGE HARVESTED AND PRODUCTION OF NAVEL AND VALENCIA ORANGES IN DISTRICT 1[a]--CENTRAL CALIFORNIA, 1945-46 TO 1962-63

Season	Acreage harvested			Production		
	Valencia	Navel	Total	Valencia	Navel	Total
		acres			carloads[b]	
1945-46	13,103	29,940	43,043	4,934	9,108	14,042
1946-47	12,607	30,310	42,917	6,507	15,018	21,525
1947-48	12,818	30,152	42,970	4,783	13,281	18,064
1948-49	7,067	30,246	37,313	1,667	7,969	9,363
1949-50	10,518	29,865	40,383	2,875	8,885	11,760
1950-51	11,945	29,881	41,826	4,285	8,363	12,648
1951-52[c]	-	-	-	-	-	-
1952-53[c]	-	-	-	-	-	-
1953-54	11,470	28,633	40,103	5,619	13,060	18,679
1954-55	11,428	28,816	40,244	5,793	14,911	20,704
1955-56	11,409	28,829	40,238	5,351	13,559	18,910
1956-57	11,456	29,440	40,896	6,703	14,645	21,348
1957-58	11,543	29,611	41,154	5,126	11,952	17,078
1958-59	11,920	31,034	42,954	7,324	19,591	26,915
1959-60	12,150	32,748	44,898	5,501	15,866	21,367
1960-61	12,556	33,742	46,298	3,358	8,669	12,027
1961-62	13,734	36,034	49,768	3,363	5,883	9,246
1962-63	14,713	38,150	52,863	5,025	14,771	19,796

[a] Includes prorate District 4--Edison.

[b] Standard carloads of 1,000 cartons 37-1/2 lbs. net.

[c] Data not available due to termination of Marketing Order.

Source: Navel and Valencia Orange Administrative Committee, Los Angeles, California.

TABLE 3. TREND IN ACREAGE HARVESTED AND PRODUCTION OF NAVEL AND VALENCIA ORANGES IN DISTRICT 2--SOUTHERN CALIFORNIA, 1945-46 TO 1962-63

Season	Acreage harvested			Production		
	Valencia	Navel	Total	Valencia	Navel	Total
		acres			carloads[a]	
1945-46	137,087	56,613	193,700	47,170	24,575	71,745
1946-47	137,242	56,067	193,309	60,579	23,331	83,910
1947-48	135,123	54,729	189,852	48,418	23,903	72,321
1948-49	127,012	49,345	176,357	47,504	15,626	63,130
1949-50	126,323	51,263	177,586	48,832	21,512	70,344
1950-51	124,177	50,279	174,456	56,312	19,902	76,214
1951-52[b]	-	-	-	-	-	-
1952-53[b]	-	-	-	-	-	-
1953-54	102,349	41,708	144,057	29,928	15,179	45,107
1954-55	92,495	38,543	131,038	42,088	15,210	57,298
1955-56	84,128	34,781	118,909	40,669	15,962	56,631
1956-57	79,080	32,904	111,984	33,917	15,462	49,379
1957-58	75,123	30,226	105,349	22,637	5,469	28,106
1958-59	73,202	30,351	103,553	39,040	13,151	52,191
1959-60	70,316	29,797	100,113	28,964	10,051	39,015
1960-61	65,239	28,464	93,703	28,428	8,756	37,184
1961-62	61,807	27,664	89,471	22,292	8,666	30,958
1962-63	58,051	26,610	84,661	27,500	9,470	36,970

[a] Standard carloads of 1,000 cartons 37-1/2 lbs. net.

[b] Data not available due to termination of Marketing Order.

Source: Navel and Valencia Orange Administrative Committee, Los Angeles, California.

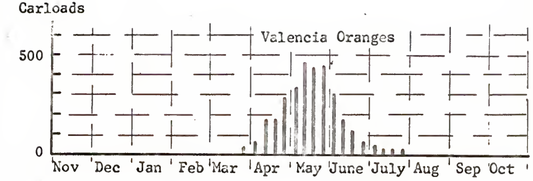
TABLE 4. TREND IN ACREAGE HARVESTED AND PRODUCTION OF NAVEL AND VALENCIA ORANGES IN DISTRICT 3--ARIZONA-DESERT-VALLEY, 1945-46 TO 1962-63

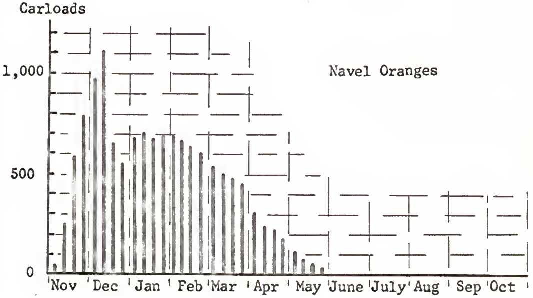
Season	Acreage harvested			Production		
	Valencia	Navel	Total	Valencia	Navel	Total
		acres			carloads[a]	
1945-46	3,885	3,828	7,713	1,379	1,125	2,504
1946-47	3,708	3,930	7,638	1,263	1,168	2,431
1947-48	3,308	3,637	6,945	766	882	1,648
1948-49	2,300	3,608	5,908	570	891	1,461
1949-50	2,829	3,408	6,237	860	1,150	2,010
1950-51	3,808	3,808	7,616	1,710	1,248	2,958
1951-52[b]	-	-	-	-	-	-
1952-53[b]	-	-	-	-	-	-
1953-54	3,378	2,183	5,561	1,227	576	1,803
1954-55	3,502	2,141	5,643	1,268	559	1,827
1955-56	3,572	2,076	5,648	1,471	520	1,991
1956-57	3,518	2,172	5,690	1,591	499	2,090
1957-58	3,644	2,215	5,859	1,601	550	2,151
1958-59	3,622	2,200	5,822	675	254	959
1959-60	4,781	2,807	7,588	2,018	603	2,621
1960-61	5,721	2,895	8,616	1,502	491	1,993
1961-62	6,633	3,119	9,752	1,696	747	2,443
1962-63	7,368	3,271	10,639	1,907	794	2,701

[a] Standard carloads of 1,000 cartons 37-1/2 lbs. net.

[b] Data not available due to termination of Marketing Order.

Source: Navel and Valencia Orange Administrative Committee, Los Angeles, California.





Source: Table 5

Figure 3. Average Weekly Shipments of Central California Valencia and Navel Oranges

regulations. Both orders provide for weekly volume proration among shipping districts for oranges shipped fresh to domestic markets, and for the establishment of minimum sizes of navel and Valencia oranges which may be shipped from each prorate district in specified periods.

Eleven members, including six grower members from the several producing areas, four handler members, and a neutral member serve on each committee. The committees meet weekly in season and set, with the approval of the Secretary of Agriculture, a weekly domestic market shipping quota for each of the producing districts. Each district's quota is then distributed among the various packing houses or handlers on the basis of the amount of tree crop controlled by the handler in relation to the total tree crop to be marketed.

The marketing order programs operate according to production districts described earlier. These are: District 1--Central California; District 2--Southern California; District 3--Arizona-Desert-Valley; and District 4--Edison.

For purposes of this study, it was assumed the current marketing order programs will remain in effect through the foreseeable future, especially with the increased number of plantings in Central California, the desert area, Texas, and Florida. Marketing order programs have been in effect for California oranges since 1933 with the exception of the 1951-52 and 1952-53 seasons when the programs were voted out by growers. The average pattern of weekly shipments of navel and Valencia oranges in Central California existing under the order was used as the basis for the development of packing house cost data. The five-year average of weekly shipments or oranges subject to regulation under the two marketing orders from Central California is shown in Table 5.

Location and Trend in Numbers of Packing Houses in Central California

Fifty-six handlers operated in Central California during the 1962-63 season.[8] Eliminating handlers with an annual volume smaller than 50,000 field boxes and handlers who packed Central California fruit outside the district, a total of 47 handlers marketed oranges in Central California in 1962-63. For purposes of this study the number of existing packing houses operating in the base year, 1962-63, was set to 47; their approximate location is indicated in Figure 4.

For the California orange industry, the trend in the number of handlers and hence, packing house facilities, has been down in recent years as indicated in Table 6. During the 1954-55 season navel oranges in California were handled by 198 handlers as compared with a total of 144 handlers in the 1962-63 season. The greatest decline in numbers has occurred in Southern California where declining acreage forced consolidations and dissolutions of packing houses. During this same period, there has also been a significant decline in the number of orange growers. The number of navel orange growers dropped from 7,454 in the 1954-55 season to 4,180 in the 1962-63 season.

In Central California the number of handlers of navel oranges declined from 70 in 1953-54 to 56 in the 1962-63 season (Table 7). This

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[8] This information was obtained from the committees administering the Navel and Valencia Orange Marketing Orders. The term "handler," as defined in each order and for the purpose of this dissertation, is substantially the same as packing house facility.

TABLE 5. AVERAGE WEEKLY SHIPMENTS OF NAVEL AND VALENCIA ORANGES SUBJECT TO REGULATION SHIPPED FROM CENTRAL CALIFORNIA

(Five-year average 1955-56 to 1959-60)

Week ending (1959-60)	Navel		Valencia		
	Average weekly shipments	Proportion of total	Average weekly shipments	Proportion of total	Total shipments
	carloads	per cent	carloads	per cent	carloads
Nov. 1	4.1	-	-	-	4.1
8	37.2	.3	-	-	37.2
15	254.0	1.9	-	-	254.0
22	578.2	4.2	-	-	578.2
29	771.6	5.7	-	-	771.6
Dec. 6	951.3	7.0	-	-	951.2
13	1,084.3	8.0	-	-	1,084.3
20	649.6	4.8	-	-	649.6
27	520.0	3.8	-	-	520.0
Jan. 3	661.6	4.9	-	-	661.6
10	718.3	5.3	-	-	718.3
17	656.8	4.8	-	-	656.8
24	688.0	5.1	-	-	688.0
31	692.0	5.1	-	-	692.0
Feb. 7	646.0	4.7	-	-	646.0
14	606.5	4.5	-	-	606.5
21	595.6	4.4	-	-	595.6
28	567.9	4.2	-	-	567.9
Mar. 6	514.4	3.8	-	-	514.4
13	480.9	3.5	6.0	.2	486.9
20	462.4	3.4	17.9	.5	480.3
27	344.0	2.5	42.6	1.2	386.6
Apr. 3	288.5	2.1	74.6	2.0	363.1
10	208.3	1.5	183.9	5.0	392.2
17	201.3	1.5	192.2	5.3	393.5
24	166.2	1.2	281.4	7.7	447.6
May 1	73.3	.5	346.3	9.5	421.6
8	52.7	.4	473.4	12.9	526.1
15	53.5	.4	437.3	12.0	490.8
22	54.6	.4	417.9	11.4	472.5
29	22.6	.1	330.0	9.0	352.6

TABLE 5.--Continued

Week ending (1959-60)	Navel Average weekly shipments	Navel Proportion of total	Valencia Average weekly shipments	Valencia Proportion of total	Total shipments
	carloads	per cent	carloads	per cent	carloads
Jun. 5	4.3	-	268.0	7.3	272.3
12	2.0	-	184.1	5.0	186.1
19	.7	-	117.4	3.2	118.1
26	2.1	-	72.9	2.0	75.0
Jul. 3	1.1	-	48.0	1.3	49.1
10	.4	-	43.3	1.2	43.7
17	-	-	22.3	.6	22.3
24	-	-	17.5	.5	17.5
31	-	-	11.4	.3	11.4
Aug. 7	-	-	7.3	.2	7.3
14	-	-	5.2	.2	5.2
21	-	-	8.4	.2	8.4
28	-	-	.3	-	.3
Sep. 4	-	-	2.7	.1	2.7
11	-	-	3.5	.1	3.5
18	-	-	1.1	-	1.1
25	-	-	8.0	.2	8.0
Oct. 2	-	-	8.7	.3	8.7
9	-	-	3.8	.1	3.8
16	-	-	.4	-	.4
23	-	-	2.4	.1	2.4
30	-	-	4.4	.1	4.4
Nov. 6	-	-	6.9	.2	6.9
13	-	-	3.9	.1	3.9
Total	13,616.3	100.0	3,657.4	100.0	17,273.7

Source: Navel and Valencia Orange Administrative Committee, Los Angeles, California.

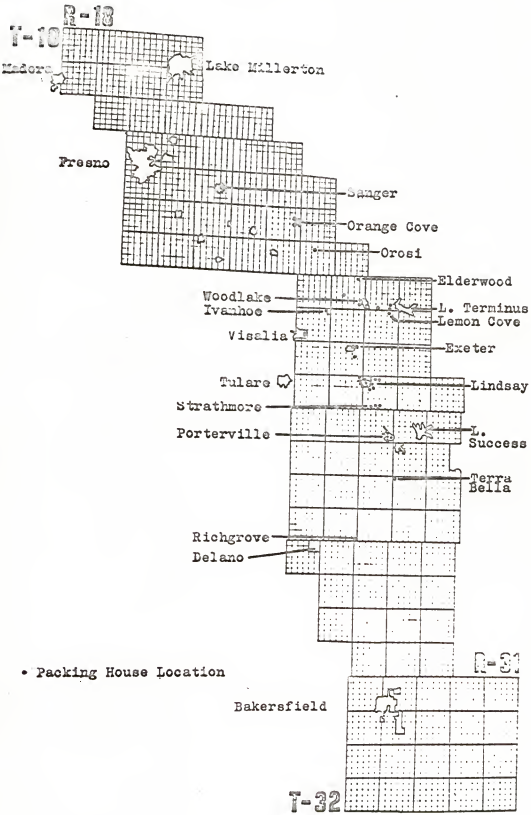

Figure 4. Location of Orange Packing Houses, Central California, 1962

TABLE 6. TREND IN THE NUMBER OF HANDLERS AND GROWERS OF NAVEL AND VALENCIA ORANGES IN CALIFORNIA AND ARIZONA,[a] 1954-55 TO 1962-63

Variety and year	Number of handlers	Number of growers
Navel		
1954-55	198	7,454
1955-56	193	6,117
1956-57	187	5,888
1957-58	171	5,565
1958-59	164	5,349
1959-60	164	5,274
1960-61	147	4,397
1961-62	146	4,249
1962-63	144	4,180
Valencia		
1954-55	195	10,749
1955-56	182	9,904
1956-57	183	8,794
1957-58	173	8,217
1958-59	171	7,799
1959-60	167	6,545
1960-61	163	5,676
1961-62	154	5,251
1962-63	151	5,075

[a] Includes handlers and growers in California and Arizona districts as defined by Navel and Valencia Orange Administrative Committee.

Source: Navel and Valencia Orange Administrative Committee, Los Angeles, California.

TABLE 7. TREND IN THE NUMBER AND SIZE OF HANDLERS AND GROWERS OF NAVEL AND VALENCIA ORANGES IN DISTRICT 1--CENTRAL CALIFORNIA, 1955-56 TO 1962-63

Variety and year	Handlers	Growers	Area harvested	Avg. acreage per handler	Avg. acreage per grower	Avg. no. growers per handler
	number	number	acres	acres	acres	number
Navel						
1955-56	70	1,551	28,179	402.6	18.2	22
1956-57	70	1,674	28,784	411.2	17.1	24
1957-58	68	1,710	28,971	426.0	16.9	25
1958-59	63	1,733	30,381	482.2	17.5	28
1959-60	63	1,787	32,081	509.2	17.9	28
1960-61	55	1,647	33,062	601.1	20.0	30
1961-62	56	1,702	35,380	631.8	20.8	30
1962-63	56	1,738	37,402	667.9	21.5	31
Valencia						
1955-56	57	930	11,409	200.1	12.3	16
1956-57	63	846	11,456	181.8	13.5	13
1957-58	58	858	11,543	199.0	13.5	14
1958-59	56	868	11,920	212.9	13.7	15
1959-60	54	878	12,150	225.0	13.8	16
1960-61	54	788	12,556	232.5	15.9	15
1961-62	54	818	13,734	254.3	16.8	15
1962-63	54	876	14,713	272.5	16.8	16

Source: Navel and Valencia Orange Administrative Committee, Los Angeles, California.

decline, in the face of increasing acreage in the district, resulted in an increase in the average acreage harvested and number of growers per handler. Average navel acreage harvested per handler rose from 402.6 acres in 1955-56 to 667.9 acres in 1962-63. During the same period the average number of growers per handler rose from 22 to 31. This same trend of increasing acraage per handler was evident in the Southern California area (Table 8).

Description of Harvesting and Packing Operations in Central California

Oranges produced in Central California are grown primarily for fresh market, but substantial quantities, mainly Valencia oranges, go to the processing outlet where the juice and oils are extracted and sold in various forms. Approximately 90 per cent of the navel oranges harvested in Central California are sold in fresh markets. Some 81 per cent of the Valencia orangas are marketed as fresh fruit. Data for the years 1953-54 to 1961-62 on tha per cent of the total crop packed as fresh fruit, the per cent sent to the by-product plants, and the per cent dumped or the fruit of no value are given in Tabla 9. Before any fruit is sent to the by-products plant, it is first processed through the packing house.

Nature of Packing House Operations[9]

A number of separate operations are involved in the process of assembling and packing oranges for fresh consumption. These operations are called "stages." Tha stages for a packing house employing

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[9] The material in this section draws heavily from Siebert, op. cit., pp. 9-16.

TABLE 8. TREND IN THE NUMBER AND SIZE OF HANDLERS AND GROWERS OF NAVEL AND VALENCIA ORANGES IN DISTRICT 2--SOUTHERN CALIFORNIA, 1955-56 TO 1962-63

Variety and year	Handlers	Growers	Area harvested	Avg. acreage per handler	Avg. acreage per grower	Avg. no. growers per handler
	number	number	acres	acres	acres	number
Navel						
1955-56	91	4,155	34,781	382.2	8.4	46
1956-57	85	3,855	32,904	387.1	8.5	45
1957-58	70	3,534	30,226	431.8	8.6	50
1958-59	69	3,330	30,351	439.9	9.1	48
1959-60	68	3,209	29,797	438.2	9.3	47
1960-61	60	2,498	28,464	474.4	11.4	41
1961-62	58	2,262	27,664	476.9	12.2	39
1962-63	53	2,198	26,610	502.1	12.1	41
Valencia						
1955-56	101	8,561	84,128	832.9	9.8	85
1956-57	95	7,573	79,080	832.4	10.4	80
1957-58	83	6,974	75,123	905.1	10.8	84
1958-59	83	6,575	73,202	881.9	11.1	79
1959-60	78	5,312	70,316	901.5	13.2	68
1960-61	74	4,504	65,239	881.6	14.5	61
1961-62	65	4,052	61,807	950.9	15.3	62
1962-63	65	3,810	58,051	893.1	15.2	59

Source: Navel and Valencia Orange Administrative Committee, Los Angeles, California.

TABLE 9. DISTRIBUTION OF CENTRAL CALIFORNIA ORANGE CROP BY USAGE AS REPORTED BY ALL HANDLERS, 1953 TO 1962[a]

Variety and year	Total movement	Cartons packed	By-products	Dumped
	carloads	per cent	per cent	per cent
Navel				
1953-54	13,884.03	88.26	8.92	2.82
1954-55	15,897.50	90.08	6.91	3.01
1955-56	14,048.15	88.24	7.53	4.23
1956-57	15,422.00	89.00	8.00	3.00
1957-58	12,605.00	95.00	3.00	2.00
1958-59	20,918.00	87.00	11.00	2.00
1959-60	15,570.00	90.00	8.00	2.00
1960-61	8,514.00	94.00	4.00	2.00
1961-62	5,721.00	94.00	4.00	2.00
Average	13,619.96	89.96	7.44	2.60
Valencia				
1954	5,875.61	90.03	9.01	.96
1955	6,001.52	83.54	15.09	1.37
1956	5,588.00	82.00	17.00	1.00
1957	7,022.00	82.00	17.00	1.00
1958	5,388.00	90.00	9.00	1.00
1959	7,601.00	77.00	22.00	1.00
1960	5,410.00	87.00	12.00	1.00
1961	3,300.00	79.00	20.00	1.00
1962	3,538.00	52.00	47.00	1.00
Average	5,524.90	81.45	17.51	1.04

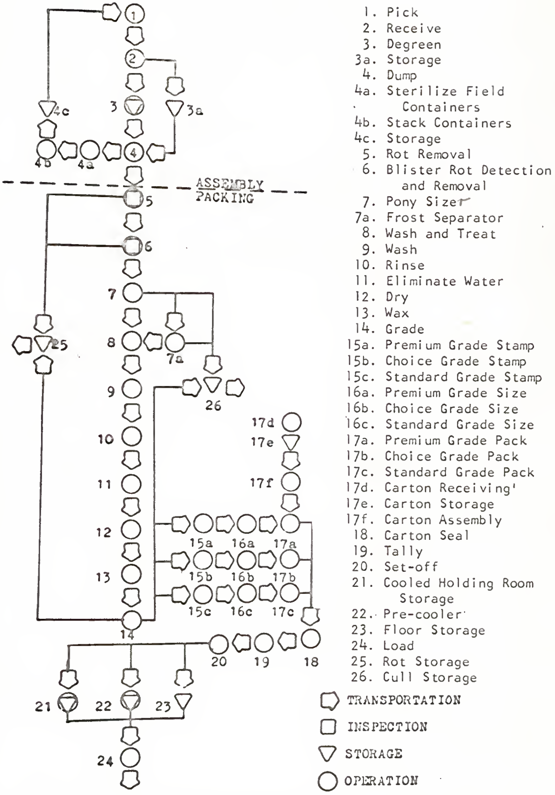
[a] District 1 defined by the Orange Administrative Committee.

Source: Navel and Valencia Orange Administrative Committee, Weekly Reports, Los Angeles, California.

technologies typical to the Central California district are diagrammed and enumerated in Figure 5.

The over-all operation of assembling and packing oranges is divided into the assembly and packing stages. These stages are further broken down into sub-stages. In Figure 5 the assembly stage includes those sub-stages above the horizontal dashed line. These stages are: (1) picking the oranges in the field and hauling them to the packing house; (2) receiving the oranges at the packing house; (3) degreening navel oranges and any off-color Valencia oranges, or placing the oranges in temporary storage if degreening is not required; and (4) dumping the oranges onto a conveyor belt leading to the pack line and sterilizing, stacking, repairing, and placing into storage the field containers. These stages are interdependent operations which depend upon a number of variables, including the hourly rate of operation, the type of field container used, and the method used to handle the oranges during picking and hauling.

Those stages beyond the dump stages are considered part of the packing stage. After the fruit has been dumped, it is inspected visually for any fruit which has rot or is otherwise contaminated. The fruit is then inspected with the aid of a special light to detect "blister rot" which cannot ordinarily be seen with the naked eye. Any fruit labeled as "rot" is dumped and not used for consumption purposes. The oranges then pass through a pre-sizer called a pony-sizer. This machine sorts out all oranges that are either very small or very large. This fruit is sent to the by-products plant and is usually labeled as "cull" or "juice."



1. Pick
2. Receive
3. Degreen
3a. Storage
4. Dump
4a. Sterilize Field Containers
4b. Stack Containers
4c. Storage
5. Rot Removal
6. Blister Rot Detection and Removal
7. Pony Sizer
7a. Frost Separator
8. Wash and Treat
9. Wash
10. Rinse
11. Eliminate Water
12. Dry
13. Wax
14. Grade
15a. Premium Grade Stamp
15b. Choice Grade Stamp
15c. Standard Grade Stamp
16a. Premium Grade Size
16b. Choice Grade Size
16c. Standard Grade Size
17a. Premium Grade Pack
17b. Choice Grade Pack
17c. Standard Grade Pack
17d. Carton Receiving'
17e. Carton Storage
17f. Carton Assembly
18. Carton Seal
19. Tally
20. Set-off
21. Cooled Holding Room Storage
22. Pre-cooler
23. Floor Storage
24. Load
25. Rot Storage
26. Cull Storage

Figure 5. A Simplified Flow Process Chart of Picking, Hauling, and Packing Citrus Fruit

If a considerable amount of fruit has been subjected to frost injury, such fruit passes through a "frost separator" in order to separate out the defective fruit. If there is no frost injury, the fruit ordinarily by-passes the frost separator in order to speed the operation and passes directly into a treatment tank after going through the pony-sizer. Here the fruit is treated with a chemical and allowed to soak in order that any crusted dirt may loosen. After the treatment tank, the fruit passes through a washer where it is brushed and washed with soap and water. Then, in a rinse unit, it is rinsed with water and brushed. Water is eliminated from the fruit when it passes over a series of brass rollers. Next the fruit is dried by blowing air over it and brushing it. Wax is then applied to provide a glossy appearance to the fruit.

The fruit is graded visually. There are usually three different categories of fruit to be graded besides the "rot" and "cull" grades already mentioned. Provisions for these grades are made in the Federal Food and Drug Act, and all shippers of fresh oranges are expected to comply with the standards set forth. The names of the grades considered in this dissertation are "premium," "choice," and "standard" and conform to "Fancy and U. S. No. 1," "U. S. Combination," and "U. S. No. 2" grades, respectively, given to California oranges by the United States Department of Agriculture.[10] The bulk of the fresh oranges for consumption is classed as the premium grade.

After the fruit is graded according to quality, it is stamped with a name according to its grade and then sized according to the number of oranges to be packed per carton. The distribution of packed cartons by sizes for navel and Valencia oranges for a five-year period is summarized in Table 10.

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[10] For a description of the grades of fruit, see United States Standards for Oranges (California and Arizona) effective September 23, 1957, U. S. D. A., Agricultural Marketing Service, Washington, D. C.

The oranges are hand packed according to grade and size. The cartons in which the oranges are packed are distributed to the packers in an assembled condition. At this stage a bi-phenyl liner is also added to the packed carton of oranges to retard decay. The packed oranges are placed onto a conveyor belt by the packer and moved through an automatic carton sealer after which they are tallied according to grower lot, size, and grade and set off onto wooden pallets. The cartons may be taken from this point to one of three destinations, depending upon the plant's marketing strategy. They may be (1) left in temporary storage on the floor of the packing house for immediate transportation to the market, (2) put into a cooled holding room, or (3) placed in cold storage to be held over for longer periods of time in order to catch the market in a more favorable position with respect to price.

TABLE 10. DISTRIBUTION OF CENTRAL CALIFORNIA PACKED CARTONS OF ORANGES SUBJECT TO REGULATION BY SIZE OF FRUIT, 1957 TO 1962

Variety and year	Size of Fruit (No. of Fruit per 37.5 Carton)									Average size
	40's	48's	56's	72's	88's	113's	138's	163's	180's	
					per cent of total packed					
Navel										
1957-58	-	1	7	21	37	24	7	2	1	94
1958-59	-	-	2	8	29	35	18	8	-	110
1959-60	-	-	3	9	26	34	20	8	-	110
1960-61	1	2	13	27	3	17	4	1	-	86
1961-62	2	9	24	37	19	6	2	1	-	91
Valencia										
1957	-	1	4	14	34	27	14	6	-	103
1958	-	-	2	11	36	34	12	4	1	104
1959	-	-	1	3	18	36	29	13	-	121
1960	-	-	3	7	24	34	21	8	3	114
1961	-	-	1	4	20	35	24	9	7	121
1962	-	-	2	8	32	35	15	5	3	109

Source: Navel and Valencia Orange Administrative Committee, Los Angeles, California.

CHAPTER III

THEORETICAL FRAMEWORK

The purpose of this chapter is to review established economic theory underlying the economic planning of production facilities in order to provide an appropriate theoretical framework for the empirical study. The discussion that follows has been divided into four sections: (1) facilities planning: its scope and relationship to economic theory; (2) the conventional theory of the firm; (3) modifications of the conventional theory; and (4) location theory.

Facilities Planning: Its Scope and Relationship to Economic Theory

Production facilities may be defined as the durable capital inputs engaged in production. The major characteristics of most durable capital inputs are that: (1) their presence is required if production is to occur; (2) there is no significantly discernible "consumption" of such inputs that can be associated with the production process; and (3) such inputs can often be considered freely variable in amount (size) prior to installation (or use), but once installed, can only be reduced in physical amount by abandonment (or temporary idling).[1]

The objective of facilities planning is to examine alternative patterns of allocating and utilizing factors of production and to evaluate the efficiencies of these alternatives. This evaluation process requires an efficiency criterion for rating the various patterns.[2] Under the assumption of a perfectly competitive market the efficiency criterion is the minimization of total costs.

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[1] Vernon L. Smith, Investment and Production: A Study in the Theory of the Capital-using Enterprise, Harvard Economic Studies, Vol. 17 (Cambridge, Massachusetts: Harvard University Press, 1961), p. 3.

Although facilities planning as a technique of economic analysis is applicable to problems at both the micro- and macro-economic levels, this study confinas itself solely to the problem of efficient allocation and utilization of facilities at the micro-economic level in the operation of orange packing houses in Central California.

At the micro-economic level, the facilities planning technique suggests optimum solutions for a wide variety of different problems in the allocation and utilization of factors of production. Among the most important of these problems are: (1) achievement of short-run productive efficiency, (2) choice of a production method, (3) optimum plant design and location, (4) expansion and consolidation of facilitias, and (5) district facilities planning.

Achievement of Short-run Production Efficiency

Through cost calculations, facilities planning may be used to develop the basic data needed to make economic decisions with respect to the improvement of individual plant operating efficiency. It also can be used to determine the optimum input allocation pattern among a group of plants producing a specified product.[3]

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[2] There are several efficiency criteria. As references see: O. H. Brownlee, "The Meaning of Efficiency in Terms of Possibilities and Choices," Economic Efficiency, Its Meaning, Measurement and Application to Agricultural Problems, Social Science Research Council, Project in Agricultural Economics (Chicago: University of Chicago, Summer, 1950) and L. L. Sammet, "Economic and Engineering Factors in Processing Plant Design" (unpublished Ph.D. thesis, University of California, Berkeley, 1958), pp. 2-8.

Choice of a Production Method

In many cases, present day technology offers several alternative methods of performing a particular production operation. These methods are usually different with respect to (1) the amount of investment needed to acquire facilities, (2) labor requirements, and (3) other production inputs. Facilities planning may be used to identify the most efficient (least-cost) method for the achievement of a production target. Moreover, this technique is also capable of indicating the optimum input combination and determining the profitability of investment in these various methods of production.[4]

Optimum Plant Design and Location

Facilities planning, through a detailed study of plant operations, provides information about the most efficient methods and input combinations for each plant component for given output rates. Integration of these methods and input combinations for all components of plant operation yields the optimum plant design for a given rate of output. Calculating the optimum plant design for different levels of output yields the data for the determination of the plant planning curve. This planning curve indicates how costs of production differ between different plant sizes. The optimum plant size is that for which the unit cost of production on the planning curve is minimized.[5]

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[3] For an example of this type of study see: Ahmed A. M. Goueli, "Economic Planning of Production and Marketing Facilities" (unpublished Ph.D. thesis, University of California, Berkeley, February, 1964), Chapters 4, 5, and 6.

[4] For an example of the calculation of pay-off period, using facilities planning, see: Eric Thor, Miriam Revzan, and Jerome B. Siebert, Bulk Containers for Citrus Fruit: Measuring Comparative Profitableness of Alternative Work Methods (Berkeley: Giannini Foundation of Agricultural Economics, Agricultural Extension Service, Mimeographed Report, 1962).

The operations of some plants require the transportation of inputs and/or the distribution of outputs. These additional components of plant operation present an optimization problem quite similar to the preceding one but with added dimensions. Here the objective of facilities planning is to minimize the combined costs of plant operation, assembly, and distribution. The optimum plant size and optimum location(s) in this case are those for which the combined long-run unit cost of production is minimized.[6]

Expansion and Consolidation of Facilities

Existing plants engaged in the production of a specified product may be confronted by a permanent change in demand, a permanent change in the production of raw materials to be processed, or both. In the case of increased demand or increased production of raw materials to be processed, the increased output of plants may be met in one of the following ways: (1) intensification of the use of existing facilities; (2) modifications to existing facilities; and (3) long-run adjustments involving the abandonment of all or part of the existing facilities and the construction of new plants with higher capacity levels. This problem may be solved by estimating the long-run costs associated with each of these three alternatives and choosing the most economic alternative.

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[5] For an example of this type of study see: Sammet, op. cit.

[6] For an example of this type of study see: B. C. French and D. G. Gillette, Cost of Assembling and Packing Apples as Related to Scale of Operation (East Lansing, Michigan: Michigan State University Agricultural Experiment Station Technical Bulletin No. 272, August, 1959).

The consolidation of facilities in order to lower unit production cost may be feasible under condition (3) above and when plants are underutilized due to a permanent decrease in raw material supplies, demand, or both. The types of adjustments which may be used to meet consolidation problems are essentially the same as in the case of facilities expansion.[7]

District Facilities Planning

Many problems in facilities planning are most meaningfully analyzed in terms of all facilities within a district. The solution to district facilities planning problems usually encompasses a combination of the types of problems previously listed.

District studies may be classified into facilities planning for new districts and facilities planning for established production districts.[8] In the newly developed districts where there are no existing plants to process available supplies of raw material, facilities planning may be used to determine the optimum size, number, and location of plants. Facilities planning in established production districts must consider existing plants in making long-run plans. Such studies involve the analysis of both fixed and variable costs over time. This study may be categorized as a long-run plan for facilities in an expanding established production district.

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[7] For examples of this type of study see: Gouell, op. cit; and J. M. Tinley and G. W. Parks, Consolidation of Citrus Packing Houses in the Ontario-Cucamonga Area (Berkeley: Giannini Foundation of Agricultural Economics Mimeographed Report No. 154, June, 1953).

[8] For an example of this type of study see: John F. Stollsteimer, "The Effect of Technical Change and Output Expansion on the Optimum Number, Size, and Location of Pear Marketing Facilities in a California Pear Production Region" (unpublished Ph.D. thesis, University of California, Berkeley, 1961).

The Conventional Theory of the Firm

The theoretical framework of facilities planning techniques is the traditional theory of the firm and location theory.[9] Portions of these theories, as well as their modifications and elaborations, which are pertinent to this study of facilities planning in Central California are presented herein. As the purpose of this chapter is to present economic theory as a tool for analysis, no attempt has been made to present a complete statement of the theory nor to extend the available body of economic theory.

Assumptions of the Conventional Theory of the Firm

One of the major simplifying assumptions of the traditional economic theory of production is that factor and product prices are determined through the functioning of a perfectly competitive market.[10] In such a perfectly competitive economy the market mechanism leads to an optimum allocation of resources, and an optimum allocation of resources in turn leads to a maximum volume of production for the available quantity of resources, or, conversely, to the least cost of producing a prescribed level of production.[11]

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[9] Comprehensive discussions of the theory of the firm may be found in any of several theory textbooks. For example, see: Ralph Blodgett, Our Expanding Economy (New York: Rinehart and Company, Inc., 1956); Kenneth E. Boulding, Economic Analysis (New York: Harper and Brothers, 1955); Sune Carlson, A Study on the Pure Theory of Production (New York: Kelly and Millman, Inc., 1956); Frederick and Vera Lutz, The Theory of Investment of the Firm (Princeton: Princeton University Press, 1951); Paul A. Samuelson, Foundations of Economic Analysis (Cambridge: Harvard University Press, 1963); George J. Stigler, The Theory of Price (New York: McMillan and Company, 1952).

[10] A "perfect competitor" is defined as one who can sell all he wishes at the going market price, but is unable in any appreciable degree

Although the perfectly competitive market is rare in the real world, the factor and product market for orange packing houses in Central California closely approximates the conditions of a competitive market. Orange packing houses in Central California are of sufficiently small size that each exerts an imperceptible influence on factor and product prices. The industry is reasonably well informed regarding prices. For these reasons the competitive model was used as a standard for judging the performance of different patterns of facilities allocation and utilization in this study.

The assumption that profit maximization is the basic objective of all business firms is fundamental to the conventional theory of the firm. While this assumption has been qualified by several writers in recent years, this single profit maximizing criteria is used in this study.[12]

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to raise or depress that market price. A "perfectly competitive market or industry" is one made up exclusively of numerous perfect competitors.

[11] Given the condition of perfect competition, the equilibrium solution for cost minimization is equivalent to the solution for profit maximization. See R. G. D. Allen, Mathematical Economics (London: Macmillan Company, Ltd., 1956), pp. 609-610 for a proof of this point.

[12] R. M. Cyert and J. G. Marsh, A Behavioral Theory of the Firm (New Jersey: Prentice-Hall, Inc., 1963), pp. 8-11; and Joel Dean and Joel Dean Associates, Managerial Economics (New York: Prentice-Hall, Inc., 1951), pp. 28-39.

The use of this criterion allows us to be concerned only with production costs, and reduces the economic problem of the least-cost expansion path of assembly and packing costs in Central California to that of determining the combination of facilities and resources which satisfy this cost minimization goal during the ten-year planning period.

Conventional cost theory assumes that in the short run the firm occupies a given fixed plant in which one of the production techniques comprising the currently available technology is used to produce one or more products.[13] For the sake of simplicity, the assumption is made that the firm produces only one product, or that a multiple product output involves fixed proportions. It is assumed that, for orange packing houses in Central California, the multiple product output of fresh oranges and by-products closely approximates this condition of multiple products with fixed proportions.

For a given period of production, inputs are classified as either fixed or variable. A fixed input is defined as a necessary input for which the rate of use or consumption is invariable with respect to the rate of output. Its costs are incurred regardless of the short-run optimizing decisions of the firm. Facilities which constitute a plant, for example, are fixed inputs. On the other hand, the rate of use of variable inputs may be adjusted to vary the rate of output. The distinction between fixed and variable inputs is temporal. Inputs which are fixed for one period of time may be variable over a longer period of time.

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[13] In theory the physical or technical relationship between inputs and outputs is expressed as a production function. The production function is designed for a given state of technology and contains only that technical information for those input combinations necessary for the maximum output obtainable.

input and output are rates of flow per unit of time. The period of time for which these flows are defined is subject to three general restrictions. In the short run, the period of time must be (1) short enough so that the firm is unable to alter the level of fixed inputs, (2) short enough that the technological improvements cannot alter the shape of the production function, and (3) long enough that technical processes may be completed. The long run is defined as a period of time sufficiently long so that the firm can alter the level of its fixed inputs, i.e., all inputs are variable in the long run.

As a matter of definition, the total cost (TC) of a firm may be written as the sum of the costs of the input items. Therefore, a firm's short-run total cost consists of (1) the sum of the price of each variable input multiplied by the amount of the input consumed, plus (2) a lump sum representing the fixed cost of the fixed inputs.

TC = Sum of variable costs + fixed cost

where

Sum of variable costs = price of input A X Quantity of input A consumed + price of input B X Quantity of input B consumed + . . .

Modifications of the Conventional Theory[14]

While the conventional marginalist economic theory of the firm provides a logical framework for the formulation of a model for estimating plant costs, a study of plant operations suggests the need for certain elaborations or modifications to make conventional theory a more useful analytical tool. For purposes of this study the areas of conventional firm theory which require elaboration or modification are:

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[14] This discussion of modifications of conventional cost theory is partially based upon B. C. French, L. L. Sammet, and R. G. Bressler, Jr., "Economic Efficiency in Plant Operations with Special Reference to the Marketing of California Pears," Hilgardia, Vol. 24, No. 19 (July, 1956), pp. 545-557.

1. A time dimension for output variations.
2. Multiple rather than single stage plants.
3. The concept of plant segmentation.
4. Limited rather than free factor substitution.
5. Discontinuous rates of inputs.
6. Changes in the level of technology over time.
7. Changes in factor prices over time.
8. The problem of durable capital inputs.
9. Risk and uncertainty.

A Time Dimension for Output Variation

Conventional cost theory assumes that short-run output variations take place entirely in the rate dimension. Actually, however, output in orange packing houses may be varied by varying either the rate of output or time of operation, or both. Output variation in the rate dimension involves intensification on the fixed inputs, and, due to the economic law of diminishing physical productivity, a curvilinear cost function is attained.[15] If, however, the rate of plant output is held constant and total output is varied by varying the number of hours worked per day or week, the uniform level of intensification in the rate sense can be expected to produce linear total variable cost and constant marginal cost relationships even though the cost function may be curvilinear in the rate dimension. If premium wage rates are paid for operations which extend beyond some minimum period, the time dimension of the cost-output relationship will be discontinuous.

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[15] The Law of Diminishing Physical Productivity states that "if the technology of production remains unchanged and successive units of some one agent are applied to a fixed amount of other productive agents, the average product per unit of the variable agent, after a certain point has been reached, will decline."

Figure 6 is a three-dimensional diagram illustrating a cost function that is curvilinear when output is varied in the rate dimension and linear when output is varied through the time dimension.

Multiple Stage Plants

From the standpoint of cost measurement, it is useful to recognize that most modern manufacturing methods involve a sequence of operations eventually resulting in a final product. While these operations, which in the aggregate form the plant, are traditionally studied as a whole, it is possible in many plants to recognize groups of activities--defined as plant "stages"--which can be studied independently.[16] By regarding the output of one stage as an independent input in the succeeding stage, each of the many stages of a plant may be represented by its own cost function. The stages for orange packing houses in Central California are described in Chapter II. The aggregate of these stage cost functions plus certain over-all costs not associated with any particular plant stage form the total plant cost function.

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[16] For further discussion of the importance of plant stages in plant cost analysis see: Hans Brems, "A Discontinuous Cost Function," American Economic Review, Vol. 42, No. 4 (September, 1952), p. 557.

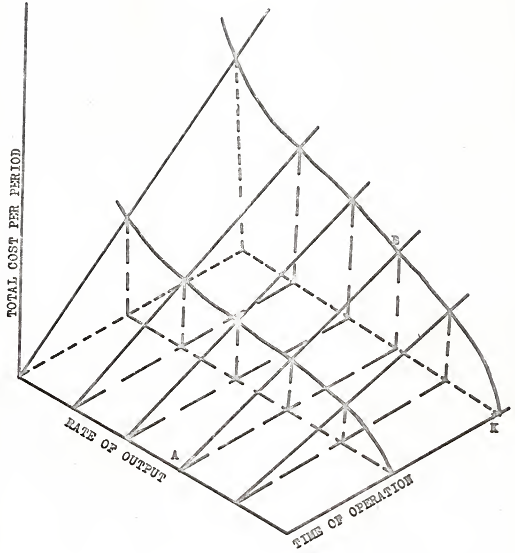

Figure 6. A Cost Surface for Producing a Single Product by Varying Both Rate and Time of Operation. Storage Costs are Assumed Zero.

Plant Segmentation

In addition to being made up of a multiplicity of operating stages, modern processing plants are frequently divided into a series of parallel processing lines, each of which is capable of independent operation. This segmentation may take place either within stages or within the entire plant. Orange packing houses with double unit packing lines are an example of plant segmentation. With this situation, rate of output can be varied either by intensification on the fixed factors comprising a single production line or by varying the number of lines operated. When variations in rate of output are associated with successive variations in the number of identical machines or lines in operation and successive variations in the number of workers performing identical jobs, with no intensification on the fixed factor or change in the proportion of inputs, the plant total cost function will be linear but discontinuous as in Figure 7.[17]

Factor Substitution

In most plant operations the degree of short-run factor substitution is very limited. Of the major inputs--labor, equipment, buildings, raw materials, and power--only labor and equipment have important substitution possibilities. Even these substitution possibilities are virtually eliminated under the conventional assumption of fixed facilities (which includes equipment) in the short run, since labor and equipment are often required in fixed proportions. In the long run the plant is variable,

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[17] Joel Dean, Statistical Cost Functions of Hosiery Mills (Chicago: University of Chicago Press, 1941), pp. 7-15.

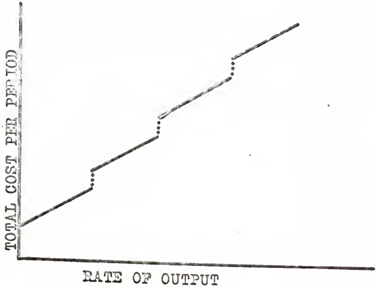

Figure 7. A Total Cost Function Discontinuous in the Rate Dimension

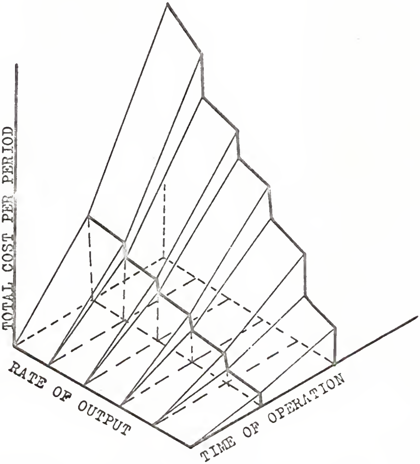

Figure 8. A Cost Surface Discontinuous in Both Time and Rate Dimension

but even in this case the degree of substitution is limited by the fact that, once a production technique is selected, the combination of labor and equipment required often is largely fixed.

Discontinuous Rates of Input

In many plant operations certain inputs are available only in discrete-size units. With such inputs additional units are made available and additional costs are incurred in a series of discontinuous steps. The five modifications discussed above indicate that stage costs, as well as total plant costs, are likely to be linear and discontinuous in both the time and rate dimensions as in Figure 8.

Changes in the Level of Technology Over Time

Changes over time in the level of technology experience in real world situations are difficult to analyze within the framework of the conventional theory of the firm. Under conventional theory the firm operates with a given production function based on a set level of technology and the operations of the law of diminishing physical productivity. This does not mean that the operation of the law of diminishing physical productivity requires that productive methods of technology be fixed through time, but it does require they be fixed at any given time.[18]

In this study it was reasonable to assume technological change will occur in orange packing house operations during the planning period. Many changes have taken place in techniques used to assemble and pack oranges in California in the past decade and additional changes are expected in the future.[19] In order to reflect these changes in the analysis the following procedure was used. The short-run cost estimates of the 47 existing packing houses reflected the level of technology during the base year 1962-63. This level was assumed constant for individual packing houses during the planning period as long as the plant operated without change in facilities from the base year. Assembly and packing cost estimates of expanded packing houses and new "model" packing houses were based on synthesized costs reflecting the level of technology expected to prevail in 1972-73.

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[18] Blodgett, *op. cit.*, p. 154.

Changes in Factor Prices Over Time

Under the competitive model used as a norm in this study the assumption was made that factor prices were constant during the production period. As in the case of technology, factor prices in real world situations are subject to change over time. Factor prices may vary not only with respect to each other but also as groups of factors, thereby resulting in changed price levels for inputs.

To provide for changing factor prices during the planning period of this study, adjustments were made to the price levels of labor, buildings, equipment, and materiel to reflect expected inflationary increases in these items.

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[19] See M. V. Johnson and W. R. Horton, "A Decade of Change," California Citrograph, Vol. 47, No. 6 (April, 1962), pp. 182-183.

The Problem of Durable Capital Inputs

As capital goods in plant operations are not completely consumed during the production period, the use of durable capital inputs must be considered as rates of flow where the real input is the use or service of the capital good. This raises a difficulty in plant cost analysis of defining the prices for services of these capital goods. It has been pointed out ". . . that over the useful life of the capital good, these prices multiplied by the inputs or use must aggregate enough to repay the original investment, pay interest on the capital, including a return for risk, and keep the equipment in a useful state of repair. In addition, government services are financed in part by property taxes levied on the basis of some valuation of these investments, and these are costs that also must be covered. Thus, capital goods give rise to certain fixed costs, including depreciation, interest, insurance (part of risk payment), repairs, and taxes."[20]

Once fixed capital or durable goods are introduced into a plant cost analysis, it cannot be assumed that the firm is interested in operations of only one short period at a time and that the firm can treat these operations as independent of the operations of subsequent short periods.[21] In the short run, costs of the fixed factor do not enter into the determination of output; they are replaced by "quasi-rents" based on the earning capacity of the investment. In the long run, fixed cost must be covered in order for equipment to be replaced and for the firm to continue in existence.

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[20] R. G. Bressler, Efficiency in the Production of Marketing Services, Social Science Research Council in Agricultural Economics, Economic Efficiency Series Paper No. 6 (Chicago: University of Chicago, 1950), p. 14.

[21] Lutz, op. cit., pp. 101-128.

The Problem of Risk and Uncertainty

Conventional theory of the firm is based on the assumption that the entrepreneur has perfect knowledge and foresight; i.e., he has a single valued expectation. In the real world entrepreneurs have imperfect knowledge of future events and decisions must be made in an environment of risk or uncertainty.

While the fundamental theoretical relationships underlying cost and production should remain basically valid regardless of the uncertainties involved, the methods by which packing houses insure against risk and uncertainty are pertinent to this study.

The situation confronting the entrepreneur can be classified as either risk or uncertainty according to the degree of predictability of the estimate concerning future periods.[22] Risk involves an estimate which can be based on a known probability distribution, while uncertainty involves variability for which no basis for forecast exists.

Pure risk need not affect decision-making and planning of the firm since it is an insurable situation. Losses and gains can be incorporated into the firm's cost schedule.

In contrast to risk, problems involving uncertainty usually cannot be "insured against," but they can be allowed for in facilities planning. For example, the output, cost, and price fluctuations which are likely to occur over the planning periods can be studied, and through the careful selection of production techniques and equipment, various degrees of "plant flexibility" can be built into the production facilities.

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[22] Earl O. Heady, Economics of Agricultural Production and Resource Use (New York: Prentice-Hall, 1952), Chapter 15.

Plant output flexibility can be obtained by: (1) building a plant of sufficient size to handle the peak volume expected with no adjustment in hours operated; (2) building a smaller plant and meeting changes in output requirements by changing the number of hours operated and introducing storage operations to adjust plant flows to demands and productive capacity; or (3) designing the plant so that the capacity output rate can be readily adjusted to changing needs.

Each of these methods of adjusting plant operations to variations in product or material flows involves costs. Building a plant of sufficient size to handle peak production requirements during normal operating hours would require a relatively high investment in production facilities and would result in over capacity during much of the operating time. Flexibility obtained through adjustments in the time dimension are paid for through storage costs and increases in operating expenses if overtime operations are involved. In addition, there are often institutional restrictions on the number of hours a plant may operate which, in effect, impose an absolute limit to this type of flexibility. Designing a plant so that plant capacity can be added or subtracted as needed generally involves the cost of being unable to utilize the least-cost production technique for at least some jobs. This latter method of obtaining output flexibility is generally attained by minimizing the use of durable capital inputs and, therefore, is most practicable when plant operations are simple and do not require specialized equipment.

In addition to plants equipped to accommodate easily output variations within and between production periods, plants which permit economical input combinations and production technique adjustments are often desired. The need for such adjustments are usually the result of (1) technical innovations and/or input cost changes which necessitate revision in previously planned input combinations and (2) unexpected changes in consumer demand which are reflected in product price changes and which necessitate changes in the input mix.

Location Theory[23]

The development of location theory was designed to overcome the shortcomings of not explicitly treating the selection of location of production activity in the conventional theory of the firm. Since the firm incurs costs for assembly of raw materials from supply sources to the processing plants and costs for shipment of final product to market, the firm's objective should be the minimization of the total combined costs of assembly, processing, and shipment operations. In order to minimize a plant's total combined costs, an entrepreneur must simultaneously seek (1) a location capable of supplying the optimum quantities of raw materials to utilize fully its productive capacity at the lowest possible transfer costs and (2) a scale of output appropriate to the demand for finished products and the supply of raw materials available within economically feasible transportation distances. Thus, under the combined theories of production and location, the scale of plant is determined primarily by the economies of larger scale processing as against the constraints of increasing transfer costs over wider supply and distribution areas and the diseconomies of larger administrative control units.

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[23] As a reference for location theory see: Walter Isard, Location and Space-Economy (New York: John Wiley and Sons, Inc., 1956).

The problem of assembling and processing oranges in Central California is analogous to "supply area" analysis.[24] The term supply area is used to indicate the geographic area from which a raw material is furnished to a producer. Using the "supply area" analysis, Siebert minimized total assembly and packing costs for Central California orange packing houses in 1972-73.[25] The assembly costs used in this study are based on these minimum assembly costs.

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[24] *Ibid.*, p. 154.

[25] Siebert, *op. cit.*, p. 169.

CHAPTER IV

THE OPTIMUM NUMBER, SIZE, AND LOCATION OF PACKING HOUSES, 1972

The determination of the optimum number, size, and location of orange packing houses in Central California in 1972 was made by Siebert.[1] This study was concerned with the estimation of the costs of assembling and packing oranges in Central California and then using these costs to calculate the least-cost combination in regard to the number, size, and location of orange packing houses. In arriving at a solution to this problem, projections of future plantings of oranges were necessary.

Because of the relevancy of Siebert's study to the problem of the least-cost expansion path of orange packing houses in Central California considered in this dissertation, it is appropriate that Siebert's study be reviewed in this chapter. Both dissertations form a part of an overall study of long-range adjustments in orange packing houses in Central California and this dissertation is in part an extension of data developed by Siebert.

The solution to the problem of optimum plant number, size, and location was made by using a theoretical model with established upper limits to plant capacity and predetermined plant locations. Four sets of data were required for a solution to the problem. These sets of data are listed below and are briefly described in following sections:

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[1] Siebert, op. cit., p. 173.

1. Estimated amount of raw material to be assembled from each origin.

2. Specification of potential plant location.

3. A transportation cost matrix which specified the cost of transporting a unit of raw material from each point of origin to each potential plant location.

4. A plant cost function which permitted the determination of the cost of processing a fixed amount of raw material.

Raw Material Sources

The estimation of amounts of raw material from each production source required the development of a projection of orange production in Central California to 1972-73.[2] These projections of production were developed from primary data on the basis of existing and expected yields per acre.

Data on orange acreage, location, variety, year of planting, and average number of trees per acre were assembled, section by section, on all present orange plantings in Central California up to and including 1962. These data were obtained from Orange Administrative Committee records, Agricultural Commissioner reports, and packing house, grower and court house records. The location of orange plantings in 1962 in Central California is shown in Figure 2.

New plantings were projected for the years 1963 through and including 1969. Projections were made section by section for all 13 Orange Administrative Committee Districts. The major factors considered in these projections were: (1) the physical and climatic conditions necessary to growing citrus on a section by section basis; (2) acres presently planted to citrus; and (3) acres presently planted to deciduous fruits and grapes. No considerations were included for changing economic conditions or changing market price of oranges. These factors were not included because it was assumed that urbanization of Southern California would continue to encourage growers and investors to plant additional acreage in Central California.

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[2] Thor and Siebert, loc. cit.

The yield per acre was estimated from a large sample of Orange Administrative Committee grove records. Data were assembled by variety and age of tree for each of the 13 Orange Administrative Committee Districts in Central California.

Projected volumes of navel and Valencia oranges by Orange Administrative Committee Districts from 1963-64 to the 1972-73 season were obtained by combining the acreage and yield per acre data discussed above. These projections indicated a potential volume of navel oranges for harvest in Central California for the 1972-73 season of 24,744,556 field boxes. The potential volume of Valencia oranges for harvest in 1972-73 was 13,289,485 field boxes.

These projected volumes of navel and Valencia oranges in Central California to 1972-73, identified on a section-township-range basis, were used as production sources in the determination of the optimum combination of the number, size, and location of packing houses in Central California. Excluded from the analysis, however, were production sources in Madera County and Orange Administrative Committee District 13 (Southern

Kern County).[3] The reason for this limitation was that Madera County and Orange Administrative Committee District 13 are areas of uncertain expansion. Although it can be predicted that these areas will increase in acreage, it was not possible to predict the extent of increase or location with any degree of reliability.

Specification of Plant Locations

Only plant locations within the Central California producing district and adjacent to existing rail and road networks were considered in the problem of number, size, and location of orange packing houses in Central California.[4] The plant locations considered were in the following towns: (1) Sanger; (2) Orange Cove; (3) Orosi; (4) Woodlake; (5) Ivanhoe; (6) Lemon Cove; (7) Exeter; (8) Lindsay; (9) Strathmore; (10) Porterville; (11) Terra Bella; and (12) Richgrove.

These towns were the locations of existing packing houses and it was considered likely by industry representatives that they would remain the location of future facilities. Air distance in miles was measured from each production origin to each of the 12 plant locations listed above.

The Assembly and Packing Cost Function

The relationship between packing and assembly costs and scale of plant for varying lengths of haul based on the "synthesis" of least-cost labor and equipment combinations into "model" plants of varying output capacities was determined. Long-run cost functions were then estimated from these calculated costs.

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[3] Siebert, op. cit., p. 151.

[4] Siebert, op. cit., p. 169.

Three alternative assembly techniques were considered in the study of assembly costs.[5] These techniques included the field box method, the bin-mounted orchard-truck method, and the straddle-carrier method. Individual analyses of these work methods were made with respect to varying size of packing houses.

The method used to calculate long-run costs was to assume the per cent of navels and Valencias of a given total volume packed per season, calculate navel and Valencia volumes for a given packing house operating rate and work method, and calculate the total assembly and packing costs for a given average distance of orchard from packing house.[6] Costs were then compared for different rates and assembly work methods for a given total volume packed per season and average distance of orchard from packing house to determine the least-cost combination of "packing house size" in operating rate per hour and assembly work method.

A relationship between total assembly costs, total volume assembled, and distance of orchard to packing house was developed.[7] This cost function was fitted to assembly cost data through the use of regression techniques resulting in the following equation representing the total assembly cost of oranges:

$$TAC = 6740.90 + .04705X_1 + 198.80X_2 + .00105X_1 \cdot X_2$$

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[5] Siebert, op. cit., p. 109.

[6] Siebert, op. cit., p. 133.

[7] Siebert, op. cit., p. 149.

Where X_1 = total volume to be assembled in units of field boxes

X_2 = distance of orchard from packing plant in miles

Total packing costs were estimated for the same specifications of distance, total volume, and percentage of navels and Valencias packed as for the total assembly and packing costs.[8] This cost function was fitted to the derived packing cost data through the use of regression techniques resulting in the following equation representing the total packing cost of oranges:

$$TPC = 103,650.00 + .59492X_1 + .50754X_2$$

Where X_1 = total field boxes of navels packed

X_2 = total field boxes of Valencias packed

The Solution

The solution to the problem of the optimum combination of number, size, and location of packing houses in Central California was developed by using the four sets of data described in this chapter and the theoretical model specified. Computations were made with the use of an IBM 1620 digital computer. The problem was approached by a three-stage minimization process. The first two steps were concerned with determining the optimum allocation of plants and raw material for a fixed total number of plants. The third step involved finding the optimum total number of plants.

These computations indicated that the least-cost number of plants per location and least-cost allocation of navel and Valencia volume was for 19 plants.[9] With 19 plants located at the towns indicated in Table 11, total assembly and packing costs for the 1972-73 season in Central California was computed to be $25,278,949. A change in the number of packing plants to a number other than 19 resulted in total costs of assembly and packing greater than the least-cost estimate.

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[8] Siebert, op. cit., pp. 149-150.

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[9] Siebert, *op. cit.*, pp. 170-171.

TABLE 11. OPTIMUM ALLOCATION OF NAVEL VOLUME, VALENCIA VOLUME, AND PACKING PLANTS IN CENTRAL CALIFORNIA, 1972-73, WITH TOTAL NUMBER OF PLANTS FIXED AT 19

Plant location	Number of plants	Navel volume	Valencia volume	Assembly costs	Packing costs	Total costs
		field boxes	field boxes	dollars	dollars	dollars
1-Sanger	1	1,399,005	429,925	204,410	1,154,150	1,358,560
2-Orange Cove	3	4,099,692	947,694	450,078	3,230,932	3,681,010
3-Orosi	1	1,394,338	798,925	144,366	1,338,655	1,483,022
4-Woodlake	1	1,385,725	803,084	136,301	1,335,642	1,471,943
5-Ivanhoe	2	2,768,181	1,352,141	271,689	2,540,412	2,812,101
6-Lemon Cove	1	1,380,211	396,869	110,326	1,126,192	1,236,518
7-Exeter	1	1,363,734	790,348	128,531	1,316,096	1,444,627
8-Lindsay	2	2,345,092	888,979	201,743	2,053,634	2,255,377
9-Strathmore	2	2,393,792	1,559,114	229,280	2,422,727	2,652,007
10-Porterville	1	1,378,566	774,077	150,642	1,316,661	1,467,303
11-Terra Bella	2	2,774,572	1,603,329	267,020	2,671,701	2,938,722
12-Richgrove	2	2,050,366	1,376,934	351,805	2,125,952	2,477,758
Total	19	24,733,274	11,721,421	2,646,191	22,632,753	25,278,949

Source: Jerome B. Siebert, "Long Range Adjustments of Orange Packing Houses in Central California: A Consideration of the Optimum Number, Size, and Location of Packing Facilities" (unpublished Ph.D. dissertation, University of California, Berkeley, 1964), p. 173.

CHAPTER V

DATA AND METHOD OF ANALYSIS

As stated in Chapter I, the objective of this study was to develop an expansion plan for orange packing houses in Central California which would approach the least-cost expansion path in terms of total assembly and packing costs for the district. A ten-year planning period was selected with the 1962-63 season designated as the base year and the 1972-73 season designated as the long-run adjustment year.[1] For purposes of this study the number of orange packing houses operating in Central California during the base year 1962-63 was set at 47.[2] These are referred to in the study as "base-year" packing houses while packing houses constructed during the planning period are referred to as "new" packing houses. The location of base-year packing houses specified by 12 plant locations is presented in Table 30 and illustrated in Figure 4.

The purpose of this chapter is to develop the data and method of analysis for the empirical study. The chapter is divided into four sections. The first discusses methods of packing house cost analysis. The second is devoted to the development of packing house cost and operational data. The third specifies the expansion paths of production and alternative expansion plans for 12 districts in Central California. The fourth is concerned with the calculations of expansion path assembly and packing costs.

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[1] This ten-year period allowed reasonably accurate projections of future orange production based on recent new plantings and was adequate for purposes of long-run facilities planning.

[2] The number of base-year packing houses is discussed in Chapter II.

Methods of Packing House Cost Analysis[3]

The problem of measuring and comparing costs may be approached in a number of different ways. The two approaches to cost analysis considered in this study were the accounting approach and the economic engineering approach. The accounting approach derives relationships from the analysis of aggregate cost and volume data. The economic engineering approach or "synthetic" method builds up descriptions of cost functions from a detailed study of plant stages and the integration of these stages to represent total plant operations.

Accounting Approach

The accounting approach to cost analysis uses accounting records or aggregate data of plants to develop cost-output relationships. Data may be collected from one or more plants and provide cross section or time series data. This method may be used to estimate unit cost or total cost functions, either by free-hand fitting or regression techniques.[4]

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[3] This discussion of packing house cost analysis is based on Goueli, op. cit., pp. 79-97. Approaches to cost measurement are also discussed in B. C. French, "Economic Efficiency in California Pear Packing Plants" (unpublished Ph.D. dissertation, University of California, Berkeley, 1953), pp. 78-99.

[4] An example of the accounting approach based on aggregate unit cost data and free-hand fitting is a study by James R. Donald and Charles E. Bishop, Broiler Processing Costs (Raleigh: North Carolina State College, Agricultural Experiment Station Series No. 59, 1957). An example of estimating total cost functions statistically is the study by Dean, loc. cit.

Estimation of the short-run cost function can be made by using cross section data from a group of plants with the same capacity, level of efficiency, same percentage of utilization of capacity, and uniform factor prices. Also, this function can be estimated from time series accounting data taken from one plant based on the assumption that size, technological conditions of plant, and factor prices do not vary over time.

Accounting data used for cost analysis should satisfy certain conditions in order to approximate plant cost-output relationships specified by economic theory.[5] These conditions include:

1. The observations on cost-output should be properly paired in the sense that cost figures should be directly associated with the output figure.
2. The time period should not be long enough to allow averaging the observations. This averaging of observations tends to obscure the variations of cost among different output levels produced in the period.
3. The observations on any given rate of output should be related to periods when the plant was fully adjusted to producing at that rate and doing so with maximum efficiency.
4. There should be a wide spread of output observations so that cost behavior can be observed at widely differing rates of output.
5. The data should be uncontaminated by the influence of factors extraneous to the cost-output relationship itself, different factor prices, and efficiency of management.
6. Data used in estimation of long-run cost functions should be based on short-run plant costs where each individual plant is operating at its minimum cost rate.

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[5] J. Johnston, Statistical Cost Analysis (New York: McGraw-Hill Book Co., 1960), pp. 26-30.

Limitations of the accounting approach.--While accounting data represents a record of actual plant operations, certain limitations and difficulties should be recognized in their use for plant cost analysis.[6]

The major difficulty in the use of accounting data arises from the frequent lack of homogeneity in plant operating conditions among different plants in the sample. This lack of homogeneity occurs when plants use different production techniques, produce different types of products, are charged different prices for inputs, and use different accounting procedures and classifications. The use of different accounting procedures, resulting in different accounting charges for the cost of the physical plant, is an important limiting factor. Such variation may be attributed to one or all of the following: (1) differences in date of purchase and cost; (2) differences in the quality of building and equipment; and (3) the use of different depreciation rates.[7]

Other problems in the use of accounting data are directly related to how closely the data in the sample approximate the conditions specified by economic theory. Problems arise if cost figures are not directly associated with output figures, or if the accounting period used by the plants studied does not approximate the unit time period relevant to economic theory. Moreover, the cost-output observations may be taken from plants which are inefficient, operating at levels not fully adjusted to the observed rate of output, or at levels below capacity.

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[6] Sammet, op. cit., p. 113.

[7] For a complete discussion of the qualities of accounting record data with respect to their use in cost analysis, see Committee on Price Determination for the Conference on Price Research, Cost Behavior and Price Policy (New York: National Bureau of Economic Research, 1943), Chapter 5.

The ideal conditions which should be satisfied in data used to estimate plant cost functions generally are not found in accounting data. However, steps may be taken to enhance the usefulness of accounting data in cost analysis. One of these steps is a program to promote uniform accounting procedures and classification among packing houses.[8] This results in greater comparability of accounting records in the sample. Accounting records also may be standardized with respect to factor prices. In this way, the variation between cost data among plants due to different factor prices may be eliminated to some extent. Accounting data may also be adjusted by selectively omitting inefficient plants from the sample or observations taken from plants where output has not fully adjusted to capacity.

Economic Engineering Approach

The economic engineering approach to plant cost analysis involves the estimation of input-output data at the elemental stage level and the synthesis of these "building blocks" into hypothetical or "model" plant operations.[9]

With plant design and production technique considered given in the short run, the short-run cost function is formed by aggregating stage cost functions and combining them with general plant costs. The development of the long-run cost function requires the selection and integration of the most efficient alternative production techniques for plants of all sizes, and for specified operating conditions.[10] The comparison of costs and efficiency with different production methods, which employ different types and amounts of durable capital inputs, must be made in terms of costs of total output throughout the life of the durable factor. For practical purposes this cost item is allocated on a pro rata basis to each production period over the service life of the durable input.

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[8] One of the objectives of the packing house management cost study in Central California described in this chapter was to promote more uniform cost accounting in the industry.

[9] For a detailed discussion of the economic engineering approach see Eric Thor, "The Application of Economic Engineering Techniques in Planning of Fruit and Vegetable Packing Plants with Special Reference to Florida Citrus" (unpublished Ph.D. dissertation, University of California, Berkeley, September, 1956), pp. 69-97.

The basic data used in plant cost synthesis are input-output standards developed at the stage level or, in some cases, with even more elemental operations. The principal sources of data to estimate basic physical and cost output relationships for labor are plant payroll and output records and engineering studies of actual operations. Four specific types of engineering studies are used in this regard: (1) detailed descriptions of plant operations; (2) time studies; (3) work sampling studies; and (4) analysis of standard work data. The cost of material and other operational inputs consisting of items such as power, fuel, water, and chemicals can be estimated by engineering studies or from plant records. Administrative costs, miscellaneous supplies, and general expenses can best be estimated from plant records. The main sources of data for estimating the cost of durable goods are plant accounting records and appraisal reports, engineering-architecture estimates of building costs, and data supplied by manufacturers of equipment and buildings.

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[10] French, Sammet, and Bressler, Jr., op. cit., pp. 572-574.

This method also has the advantage of providing an estimate of least-cost for a given output rather than the average relationships usually determined by regression analysis. A great advantage of plant cost synthesis is that the forms of the plant cost equation and stage cost function are determined on the basis of logic.

Limitations of plant cost synthesis.--This method frequently involves relatively intensive research. This is because information used in plant cost synthesis needs to be in detail and can be obtained in most cases only by gathering large quantities of data. Moreover, some factors such as management and direct overhead expense often cannot be measured directly. The practical solution is generally to combine engineering data with accounting data.

Packing House Cost and Operational Data

Packing house costs and operational data required for the determination of the least-cost expansion path include:

1. Estimated packing costs for new "model" packing houses.
2. Estimated packing costs for base-year packing houses.
3. Estimated assembly costs for new and base-year packing houses.
4. Estimated capacity ratings for base-year packing houses.
5. Estimated increases in packing costs associated with packing house expansion.

Calculation of Packing House Costs

Packing costs for the 47 base-year packing houses and new "model" packing houses in Central California at 1962-63 season price levels were estimated by using a combination of the accounting and economic engineering approach.

To facilitate the synthesis of packing house costs, the components of total costs of packing and assembly were grouped into assembly and packing stages. The packing operation was further divided into the following stages: (1) dump, pre-grade, and pre-size; (2) wash, dry, and wax; (3) grade; (4) stamp; (5) size; (6) pack; (7) carton seal; (8) tally; (9) set off; (10) load; and (11) miscellaneous operations. Also considered were costs of administration, supervision, office, and buildings. Several technical states were included in some of these stages. Efficient technologies for selected rates of output for all stages were determined and then integrated into short-run plant cost estimates.

Specifications and Simplifications

In order to develop estimates of short-run packing costs for base-year and new "model" packing houses, it was necessary to specify the cost of labor, equipment, building, and other packing house costs. The following is a discussion of these costs, simplifications, and specifications which served as a basis for packing cost estimation.

Labor.--The economic engineering approach to determine labor costs involved two steps. In the first step, time requirements for the physical performance of a particular job were determined mainly from a work sampling method, commonly called ratio delay.[11] With the establishment of reliable time requirements for the physical performance of a job, the number of workers required for a given rate of operation was determined. Multiplying the required number of workers by the appropriate wage rate determined the labor cost.

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[11] See L. L. Sammet and J. B. Hassler, "Use of the Ratio-Delay Method in Processing Plant Operations," Agricultural Economics Research, Vol. III, No. 4 (1951), p. 129, for a more complete discussion of work sampling techniques.

Wage rates varied by job classification and the number of workers per job classification differed as the scale of plant changed. Wage rates by job classification for 1962 are presented in Table 12.

Two categories were used in the worker classification--salaried and hourly workers. In general, salaried workers are retained all year, irrespective of the volume packed. On the other hand, hourly workers are employed only when the packing house is in operation, with one exception. Under the state work law an hourly worker is guaranteed at least four hours of pay for each day he reports for work regardless of whether work is performed or not. An hourly worker also earns time-and-a-half for every hour worked over 40 hours per week. In this study 56 hours were set as the maximum weekly hours worked.

Equipment.--Equipment costs were divided into fixed and variable costs. Variable costs included costs of fuel and power and repairs attributable to use. Engineering data were used for the determination of fuel and power costs. Estimating variable repair costs was more difficult than estimating fuel and power costs because of the interaction of repair costs and depreciation costs associated with wear and time.

Fixed costs of equipment were divided into depreciation, interest, repairs, taxes, and insurance. Depreciation rates depend primarily on the "use-life" of the equipment. "Use-life" of all equipment was estimated to be ten years. Therefore, depreciation charges for equipment,

TABLE 12. WAGE RATES BY JOB CLASSIFICATION AND NUMBER OF WORKERS PER NUMBER OF FIELD BOXES PACKED PER HOUR, 1962

Job Classification	1962 Wage rate		Workers required for various per hour field box volumes							
	Monthly	Hourly	250	500	750	1,000	1,250	1,500	1,750	2,000
	dollars		number of workers							
Manager	a									
Asst. Manager	500		1	1	1	1	1	1	1	1
Office Manager	500		0	0	0	0	1	1	1	1
Asst. Bookkeeper	450		1	1	1	1	1	1	1	1
Pool Record Clerk		1.90				1	1	1	1	1
Payroll Clerk		2.05	1	1	1	1	1	1	1	1
Fieldman	500		1	1	1	1	2	2	2	2
Packing House Superintendent	600		1	1	1	1	1	1	1	1
Grade and Pack Foreman	500		1	1	1	1	1	1	1	1
Asst. Grade and Pack Foreman	450		0	0	0	0	1	1	1	1
Receiving Foreman	450		1	1	1	1	1	1	1	1
Receivers		1.55	b	b	b	b	b	b	b	b
Graders		1.65	6	9	14	18	23	28	32	36
Packers		2.00	10	16	22	30	38	44	52	60
Carton Tally		1.35	1	1	2	2	3	4	4	4
Carton Set-off		1.35	1	1	1	1	2	2	2	2
Loaders		1.35	1	1	1	2	2	2	3	3
Carton unload and load fork trucker		1.55	1	1	1	1	1	1	1	1

TABLE 12.--Continued

Job Classification	1962 Wage rate		Workers required for various per hour field box volumes							
	Monthly	Hourly	250	500	750	1,000	1,250	1,500	1,750	2,000
	dollars		number of workers							
Mechanic		1.75	1	1	1	1	1	1	1	1
Night Watch and Cleanup		1.35	1	1	1	1	2	2	2	2

[a] Varies with volume per hour as follows:

250 field boxes per hour	$ 800
500 field boxes per hour	900
750 field boxes per hour	1,000
1,000 field boxes per hour	1,100
1,250 field boxes per hour	1,200
1,500 field boxes per hour	1,300
1,750 field boxes per hour	1,400
2,000 field boxes per hour	1,500

[b] Varies with type of work method used in assembly.

using the straight line method, were 10 per cent per year of the estimated equipment price. Interest costs were calculated at 6 per cent of the undepreciated balance over the ten-year period, which amounted to interest costs of 3.3 per cent per year of the original cost. Taxes, insurance, and repairs were calculated at 3 per cent of the original cost. When all components of fixed costs were added together, total fixed costs equaled 16.3 per cent of the estimated purchase price.

Building.--Building costs were derived from engineering estimates based on the physical qualities of material and labor used in constructing specific types of buildings for a specified scale of operation.

Fixed costs of buildings were divided into depreciation, interest, repairs, taxes, and insurance. Depreciation was calculated on the basis of a 25-year "use-life" using the straight line depreciation method. A charge of 6 per cent of the undepreciated balance was made for interest charges. This interest amounted to a charge of 3.3 per cent per year of the original cost. Taxes, insurance, and fixed repair costs were estimated to be 4.3 per cent per year of the original building cost. Total fixed costs of buildings amounted to 11.6 per cent of the original price.

Length of season and seasonal variation.--The length of packing season for a particular packing house generally varies slightly from year to year, depending upon the maturity of the fruit and market demand.[12] In the case of Central California oranges, this information is reflected in the Orange Administrative Committee's report of weekly shipments presented in Table 5. This pattern of average weekly shipments of oranges from Central California is summarized in Table 13 and served in this study as the basis for the calculation of packing costs. All costs were synthesized on the basis of a 40 week operating season with the weekly volumes as indicated.

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[12] Eric Thor, Economies of Scale in the Operation of Florida Citrus Houses (Gainesville: University of Florida, Agricultural Experiment Station Bulletin 606, 1959), p. 12.

Composition of packed output.--The average pack-out ratio and the proportion of oranges packed by size and grade in Central California was described in Chapter II. These relationships served as the basis for cost calculations. It was further assumed that all oranges picked were processed through a packing house. Units of 50 pound field boxes were used to receive the fruit, and 37.5 pound fiberboard cartons were used for packing.

Types of packing houses.--Two types of packing houses were considered as a basis for cost calculations. The first consisted of a single unit house with one packing line operating throughout the entire season. Operating rates for this type of packing house were assumed to be 250, 500, 750, and 1,000 field boxes per hour. The second type of packing house consisted of a double unit packing house with duplicate equipment units. One line operated the entire season; the secondary line was used only during periods which would result in overtime operations of the primary line. Operating rates for the double unit packing house were 1,250, 1,500, 1,750, and 2,000 field boxes per hour.

Storage of packed fruit.--Fruit sometimes goes through a cooled holding room or cold storage before it is shipped. As it was not the purpose of this study to provide a market strategy with respect to storage, this operation was not included in the study. Unit costs for this

TABLE 13. SEASONAL VARIATIONS DURING MAJOR PORTION OF SHIPPING PERIOD IN NAVEL AND VALENCIA ORANGE SHIPMENTS FROM CENTRAL CALIFORNIA

(Five-year average 1955-56 to 1959-60)

Week	Navel		Valencia	
	Average weekly shipments	Proportion of total	Average weekly shipments	Proportion of total
	carloads	per cent	carloads	per cent
1	4.1	-	-	-
2	37.2	.3	-	-
3	254.0	1.9	-	-
4	578.2	4.2	-	-
5	771.6	5.7	-	-
6	951.3	7.0	-	-
7	1,084.3	8.0	-	-
8	649.6	4.8	-	-
9	520.0	3.8	-	-
10	661.6	4.9	-	-
11	718.3	5.3	-	-
12	656.8	4.8	-	-
13	688.0	5.1	-	-
14	692.0	5.1	-	-
15	646.0	4.7	-	-
16	606.5	4.5	-	-
17	595.6	4.4	-	-
18	567.9	4.2	-	-
19	514.4	3.8	-	-
20	480.9	3.5	6.0	.2
21	462.4	3.4	17.9	.5
22	344.0	2.5	42.6	1.2
23	288.5	2.1	74.6	2.1
24	208.3	1.5	183.9	5.1
25	201.3	1.5	192.2	5.4
26	166.2	1.2	281.4	7.8
27	73.3	.5	348.3	9.7
28	52.7	.4	473.4	13.2
29	53.5	.4	437.3	12.2
30	54.6	.4	417.9	11.6
31	22.6	.1	330.0	9.2
32	-	-	268.0	7.5
33	-	-	184.1	5.1
34	-	-	117.4	3.3
35	-	-	72.9	2.0
36	-	-	48.0	1.3
37	-	-	43.3	1.2

TABLE 13.--Continued

Week	Navel Average weekly shipments	 Proportion of total	Valencia Average weekly shipments	 Proportion of total
	carloads	per cent	carloads	per cent
38	-	-	22.3	.6
39	-	-	17.5	.5
40	-	-	11.4	.3
Total	13,605.7	100.0	3,590.4	100.0

Source: Derived from data in Table 5.

function tend to be equal for all firms regardless of size. Therefore, the inclusion of this cost would not significantly affect the cost relationships between alternative expansion plans.

Packing Cost of New Packing Houses

On the basis of the costs and specifications set forth in the preceding section, costs were synthesized for different stages for new "model" packing houses using 1962 price levels.[13] The results of this cost synthesis in terms of total fixed and variable cost per hour for equipment and building, labor, and supplies for eight levels of plant operation are shown in Tables 14 through 21, inclusive.

Total fixed cost and variable cost per field box for eight levels of plant output are summarized in Table 22. These total fixed and per unit variable costs serve as the estimates of packing costs for new packing houses in the calculation of expansion path cost.

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[13] These cost syntheses follow the stages for a "model" packing house developed by Siebert, op. cit., pp. 61-107. This section gives a detailed elaboration of stages and cost estimates for the 1972-73 season.

TABLE 14. EQUIPMENT, BUILDING, LABOR AND MISCELLANEOUS COSTS OF PACKING ORANGES IN A 250 FIELD BOX PER HOUR SINGLE LINE PACKING HOUSE BY STAGE AND COST COMPONENTS, 1962-63

Stage or cost component	Equipment and building		Labor		Supplies and misc.		Total	
	Fixed cost	Variable cost	Fixed cost	Variable cost	Fixed cost	Variable cost	Fixed cost	Variable cost
	dollars	dols/hr	dollars	dols/hr	dollars	dols/hr	dollars	dols/hr
Dump	3,092	.280	---	3.30	---	---	3,092	3.580
Wash, Dry, Wax	6,277	.200	---	---	---	5.81	6,277	6.010
Grade	2,333	.088	---	6.58	---	---	2,333	6.668
Stamp	2,445	.009	---	---	---	.27	2,445	.036
Size	2,525	.044	---	---	---	---	2,525	.044
Pack	6,652	.222	---	21.49	---	72.52	6,652	94.232
Carton Seal	1,731	.025	---	---	---	.65	1,731	.090
Tally	2	---	---	1.35	---	---	2	1.350
Set-off	130	---	---	1.35	---	---	130	1.350
Load	130	---	---	1.35	---	---	130	1.350
Cull Bin	3,081	.063	---	---	---	---	3,081	.063
Misc. Equipment & Labor	3,490	2.940	---	1.55	---	---	3,490	4.490
Building	17,288	---	---	---	---	---	17,288	---
Office, Supervision & Night Watch	897	---	38,902	---	964	---	40,763	---
TOTAL	50,073	3.871	38,902	36.97	964	79.25	89,939	119.091

TABLE 15. EQUIPMENT, BUILDING, LABOR AND MISCELLANEOUS COSTS OF PACKING ORANGES IN A 500 FIELD BOX PER HOUR SINGLE LINE PACKING HOUSE BY STAGE AND COST COMPONENTS, 1962-63

Stage or cost component	Equipment and building Fixed cost	 Variable cost	Labor Fixed cost	 Variable cost	Supplies and misc. Fixed cost	 Variable cost	Total Fixed cost	 Variable cost
	dollars	dols/hr	dollars	dols/hr	dollars	dols/hr	dollars	dols/hr
Dump	3,092	.280	---	4.94	---	---	3,092	5.220
Wash, Dry, Wax	6,277	.200	---	---	---	11.69	6,277	11.890
Grade	2,333	.088	---	9.87	---	---	2,333	9.958
Stamp	2,445	.009	---	---	---	.54	2,445	.549
Size	2,525	.044	---	---	---	---	2,525	.044
Pack	6,652	.222	---	33.46	---	145.03	6,652	178.712
Carton Seal	1,731	.025	---	---	---	1.30	1,731	1.325
Tally	2	---	---	1.35	---	---	2	1.350
Set-off	130	---	---	1.35	---	---	130	1.350
Load	130	---	---	1.35	---	---	130	1.350
Cull Bin	3,081	.063	---	---	---	---	3,081	.063
Misc. Equipment & Labor	3,668	4.540	---	3.30	---	---	3,668	7.840
Building	22,023	---	---	---	---	---	22,023	---
Office, Supervision & Night Watch	897	---	49,110	---	1,757	---	51,764	---
TOTAL	54,986	5.471	49,110	55.62	1,757	158.56	105,853	219.651

TABLE 16. EQUIPMENT, BUILDING, LABOR AND MISCELLANEOUS COSTS OF PACKING ORANGES IN A 750 FIELD BOX PER HOUR SINGLE LINE PACKING HOUSE BY STAGE AND COST COMPONENTS, 1962-63

Stage or cost component	Equipment and building		Labor		Supplies and misc.		Total	
	Fixed cost	Variable cost	Fixed cost	Variable cost	Fixed cost	Variable cost	Fixed cost	Variable cost
	dollars	dols/hr	dollars	dols/hr	dollars	dols/hr	dollars	dols/hr
Dump	3,092	.280	---	6.58	---	---	3,092	6.860
Wash, Dry, Wax	6,781	.280	---	---	---	17.46	6,781	17.740
Grade	2,657	.088	---	16.44	---	---	2,657	16.528
Stamp	2,445	.009	---	---	---	.81	2,445	.819
Size	2,525	.044	---	---	---	---	2,525	.044
Pack	7,302	.247	---	46.97	---	217.67	7,302	264.887
Carton Seal	1,731	.025	---	---	---	1.95	1,731	1.975
Tally	5	---	---	2.70	---	---	5	2.700
Set-off	130	---	---	1.35	---	---	130	1.350
Load	130	---	---	1.35	---	---	130	1.350
Cull Bin	3,081	.063	---	---	---	---	3,081	.063
Misc. Equipment & Labor	3,815	6.150	---	3.30	---	---	3,815	9.450
Building	26,198	---	---	---	---	---	26,198	---
Office, Supervision & Night Watch	897	---	50,306	---	2,341	---	53,544	---
TOTAL	60,789	7.186	50,306	78.69	2,341	237.89	113,436	323.766

TABLE 17. EQUIPMENT, BUILDING, LABOR AND MISCELLANEOUS COSTS OF PACKING ORANGES IN A 1,000 FIELD BOX PER HOUR DOUBLE LINE PACKING HOUSE BY STAGE AND COST COMPONENTS, 1962-63

Stage or cost component	Equipment and building		Labor		Supplies and misc.		Total	
	Fixed cost	Variable cost	Fixed cost	Variable cost	Fixed cost	Variable cost	Fixed cost	Variable cost
	dollars	dols/hr	dollars	dols/hr	dollars	dols/hr	dollars	dols/hr
Dump	3,092	.280	---	6.58	---	---	3,092	6.860
Wash, Dry, Wax	7,392	.231	---	---	---	23.39	7,392	23.621
Grade	3,146	.088	---	23.02	---	---	3,146	23.108
Stamp	2,445	.009	---	---	---	1.09	2,445	1.099
Size	2,525	.044	---	---	---	---	2,525	.044
Pack	7,788	.247	---	62.92	---	290.06	7,788	353.227
Carton Seal	1,731	.025	---	---	---	---	1,731	.025
Tally	5	---	---	2.70	---	2.61	5	5.310
Set-off	130	---	---	1.35	---	---	130	1.350
Load	130	---	---	2.70	---	---	130	2.700
Cull Bin	3,081	.063	---	---	---	---	3,081	.063
Misc. Equipment & Labor	4,059	7.770	---	3.30	---	---	4,059	11.070
Building	31,364	---	---	---	---	---	31,364	---
Office, Supervision & Night Watch	897	---	51,503	---	3,029	---	55,429	---
TOTAL	67,785	8.757	51,503	102.57	3,029	317.15	122,317	428.477

TABLE 18. EQUIPMENT, BUILDING, LABOR AND MISCELLANEOUS COSTS OF PACKING ORANGES IN A 1,250 FIELD BOX PER HOUR DOUBLE LINE PACKING HOUSE BY STAGE AND COST COMPONENTS, 1962-63

Stage or cost component	Equipment and building Fixed cost	Equipment and building Variable cost	Labor Fixed cost	Labor Variable cost	Supplies and misc. Fixed cost	Supplies and misc. Variable cost	Total Fixed cost	Total Variable cost
	dollars	dols/hr	dollars	dols/hr	dollars	dols/hr	dollars	dols/hr
Dump	6,184	.557	---	11.51	---	---	6,184	12.067
Wash, Dry, Wax	13,061	.409	---	---	---	20.740	13,061	21.149
Grade	4,993	.177	---	26.31	---	---	4,993	26.487
Stamp	4,870	.019	---	---	---	1.357	4,870	1.376
Size	5,051	.088	---	---	---	---	5,051	.088
Pack	13,955	.481	---	80.42	---	362.567	13,955	443.468
Carton Seal	3,464	.050	---	---	---	3.150	3,464	3.200
Tally	7	---	---	4.04	---	---	7	4.04
Set-off	261	---	---	2.69	---	---	261	2.69
Load	261	---	---	2.69	---	---	261	2.69
Cull Bin	3,136	.088	---	---	---	---	3,136	.088
Misc. Equipment & Labor	5,953	2.037	---	3.29	---	8.025	5,953	13.352
Building	47,129	---	---	---	---	---	47,129	---
Office, Supervision & Night Watch	1,010	---	77,690	---	3,717	---	82,417	---
TOTAL	109,335	3.906	77,690	130.95	3,717	395.839	190,742	530.695

TABLE 19. EQUIPMENT, BUILDING, LABOR AND MISCELLANEOUS COSTS OF PACKING ORANGES IN A 1,500 FIELD BOX PER HOUR DOUBLE LINE PACKING HOUSE BY STAGE AND COST COMPONENTS, 1962-63

Stage or cost component	Equipment and building		Labor		Supplies and misc.		Total	
	Fixed cost	Variable cost	Fixed cost	Variable cost	Fixed cost	Variable cost	Fixed cost	Variable cost
	dollars	dols/hr	dollars	dols/hr	dollars	dols/hr	dollars	dols/hr
Dump	6,184	.557	---	13.15	---	---	6,184	13.707
Wash, Dry, Wax	13,565	.418	---	---	---	24.877	13,565	25.295
Grade	5,317	.177	---	32.88	---	---	5,317	33.057
Stamp	4,870	.019	---	---	---	1.629	4,870	1.648
Size	5,051	.088	---	---	---	---	5,051	.088
Pack	14,603	.520	---	92.39	---	435.080	14,603	527.990
Carton Seal	3,464	.050	---	---	---	3.910	3,464	3.960
Tally	9	---	---	5.39	---	---	9	5.390
Set-off	261	---	---	2.69	---	---	261	2.690
Load	261	---	---	2.69	---	---	261	2.690
Cull Bin	3,136	.088	---	---	---	---	3,136	.088
Misc. Equipment & Labor	6,233	2.100	---	3.29	---	9.415	6,233	14.805
Building	52,342	---	---	---	---	---	52,342	---
Office, Supervision & Night Watch	1,010	---	78,887	---	4,405	---	84,302	---
TOTAL	116,306	4.017	78,887	152.48	4,405	474.911	199,598	631.408

TABLE 20. EQUIPMENT, BUILDING, LABOR AND MISCELLANEOUS COSTS OF PACKING ORANGES IN A 1,750 FIELD BOX PER HOUR DOUBLE LINE PACKING HOUSE BY STAGE AND COST COMPONENTS, 1962-63

Stage or cost component	Equipment and building		Labor		Supplies and misc.		Total	
	Fixed cost	Variable cost	Fixed cost	Variable cost	Fixed cost	Variable cost	Fixed cost	Variable cost
	dollars	dols/hr	dollars	dols/hr	dollars	dols/hr	dollars	dols/hr
Dump	6,200	.557	---	13.15	---	---	6,200	13.707
Wash, Dry, Wax	14,174	.441	---	---	---	29.041	14,174	29.482
Grade	5,896	.177	---	39.47	---	---	5,896	39.647
Stamp	4,870	.019	---	---	---	1.901	4,870	1.920
Size	5,051	.088	---	---	---	---	5,051	.088
Pack	15,091	.520	---	109.89	---	507.600	15,091	618.010
Carton Seal	3,464	.050	---	---	---	4.560	3,464	4.610
Tally	9	---	---	5.39	---	---	9	5.39
Set-off	261	---	---	2.69	---	---	261	2.69
Load	261	---	---	4.04	---	---	261	4.04
Cull Bin	3,136	.088	---	---	---	---	3,136	.088
Misc. Equipment & Labor	6,533	2.173	---	3.29	---	10.963	6,533	16.426
Building	56,627	---	---	---	---	---	56,627	---
Office, Supervision & Night Watch	1,010	---	80,084	---	5,092	554.065	207,759	736.098
TOTAL	122,583	4.113	80,084	177.92	5,092	554.065	207,759	736.098

TABLE 21. EQUIPMENT, BUILDING, LABOR AND MISCELLANEOUS COSTS OF PACKING ORANGES IN A 2,000 FIELD BOX PER HOUR DOUBLE LINE PACKING HOUSE BY STAGE AND COST COMPONENTS, 1962-63

Stage or cost component	Equipment and building		Labor		Supplies and misc.		Total	
	Fixed cost	Variable cost	Fixed cost	Variable cost	Fixed cost	Variable cost	Fixed cost	Variable cost
	dollars	dols/hr	dollars	dols/hr	dollars	dols/hr	dollars	dols/hr
Dump	6,209	.557	---	13.16	---	---	6,209	13.717
Wash, Dry, Wax	14,782	.463	---	---	---	33.178	14,782	33.641
Grade	6,289	.177	---	48.72	---	---	6,289	48.897
Stamp	4,870	.019	---	---	---	2.173	4,870	2.192
Size	5,051	.088	---	---	---	---	5,051	.088
Pack	15,576	.520	---	125.84	---	580.108	15,576	706.468
Carton Seal	3,464	.050	---	---	---	5.214	3,464	5.264
Tally	9	---	---	5.39	---	---	9	5.39
Set-off	261	---	---	2.69	---	---	261	2.69
Load	261	---	---	4.04	---	---	261	4.04
Cull Bin	3,136	.088	---	---	---	---	3,136	.088
Misc. Equipment & Labor	6,848	2.281	---	3.29	---	12.511	6,848	18.082
Building	61,733	---	---	---	---	---	61,733	---
Office, Supervision & Night Watch	1,010	---	81,280	---	5,776	---	88,066	---
TOTAL	129,499	4.243	81,280	203.13	5,776	633.184	216,555	840.557

TABLE 22. PURCHASE PRICE, TOTAL FIXED COST, AND PER UNIT FIXED AND VARIABLE PACKING COSTS FOR NEW PACKING HOUSES BY OPERATING RATE AND CAPACITY, 1962

Operating rate in field boxes per hour	Capacity[a]	Purchase price 1962	Packing Cost		
			Total fixed cost	Per unit fixed cost	Per unit variable cost
		dollars	dollars	dollars per field box	
250	A	349,916	89,939	.35976	.47636
500	B	391,753	105,953	.21170	.43930
750	C	437,668	113,436	.15125	.43168
1,000	D	493,353	122,317	.12232	.42848
1,250	E	787,220	190,742	.15259	.42455
1,500	F	842,872	199,598	.13306	.42094
1,750	G	891,958	207,759	.11872	.42063
2,000	H	947,009	216,555	.10828	.42028

[a] Code for packing house capacity indicated in Table 27.

Source: Derived from Tables 14 through 21, inclusive.

Packing Cost of Base-year Packing Houses

Estimates of short-run packing costs of the 47 base-year packing houses were developed from cost data and specifications discussed in the preceding section and from accounting data.

Source and type of data.--Basic data used in the development of packing costs for base-year packing houses were obtained from two research projects. The first was an extensive field survey, conducted by this analyst, of all orange packing houses operating in Central California during the 1962-63 season. The second was a detailed packing house-management study of assembly and packing costs of 20 citrus packing houses in Central California conducted during the 1961-62 and 1962-63 seasons.[14]

During the field survey a variety of data relating to assembly and packing house costs and operations were collected. All 47 base-year packing houses in Central California were contacted. Cooperation was obtained from the majority of packing houses; packing house managers provided data on a confidential basis. An outline of the type of packing house data collected in Central California is presented in Appendix A.

Accounting procedure.--Cost data for individual packing houses obtained from the packing house-management study and field survey were grouped into fixed and variable costs for labor, buildings and equipment and material and miscellaneous items. When accounting data were not available, costs were synthesized through the use of the economic engineering approach. In categorizing costs into fixed and variable costs for the base-year packing houses, the following grouping of accounts and ledger items was used:

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[14] This confidential packing house-management study was a project of the Agricultural Extension Service, University of California, in cooperation with Sunkist Growers, Inc. Its objective was to develop cost data helpful to management in decision-making and also to promote more uniform and comparable accounting methods between packing houses.

- I. Labor Costs
    - A. Fixed costs--all salaried workers. Ledger items included salaries of manager, office staff, field men, packing house superintendent, grade and pack foremen, receiving foremen, and night watchmen. Also included were costs of retirement and medical programs plus costs of workmen's compensation insurance.
    - B. Variable costs--all hourly or piece workers. Ledger items included wages of graders, packers, and general floor labor. Also included were costs of workmen's compensation and unemployment insurance.
- II. Buildings and Equipment
    - A. Fixed costs--all overhead costs of buildings and equipment. Ledger items included costs of depreciation, interest, repairs, taxes, fire and casualty insurance, and property taxes.
    - B. Variable costs--all operating costs of equipment. Ledger items included costs of electricity, water, gasoline, oil, etc.
- III. Material and Miscellaneous Costs
    - A. Fixed costs--all general overhead costs. Ledger items included costs of office supplies, telephone and telegraph, legal and audit, board of directors' fees, and miscellaneous charges.
    - B. Variable costs--all variable costs of material. Ledger items included costs of cartons, labels, glue, washing supplies, wax, etc.

Standardization of costs.--In the development of short-run packing costs for the base-year packing houses in Central California, costs were standardized to reflect: (1) uniform salary and wage rates at 1962 levels, (2) uniform depreciation charges based on 1962 market value and a straight-line method of depreciation charge, and (3) plant operations close to the capacity rating of the packing house.[15]

Uniform salary and wage rates used in the analysis were those presented in Table 12. The method of calculating depreciation charges was described in an earlier section of this chapter.

These standardized short-run packing costs in terms of total fixed costs and per unit variable costs for the 47 base-year packing houses are presented in Table 23. They serve as the estimate for base-year packing costs in the calculation of expansion path costs.

Assembly Cost of New and Base-year Packing Houses

The process of assembling oranges for packing consists of an aggregation and integration of the stages of assembly outlined in Chapter II. The assembly stages were: (1) picking the oranges in the orchard and hauling them to the packing house; (2) receiving the oranges at the packing house; (3) degreening, or placing the oranges in temporary storage; and (4) dumping the oranges onto a conveyor belt leading to the pack line.

Two alternative assembly techniques were considered in this study. The first technique was the long-established field box method; the second and newer was bulk-handling. Several bulk-handling techniques are

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[15] Market value in many cases reflected the salvage value of house and equipment. Estimates were based on appraisal reports of individual packing houses and estimates made by staff of the Research and Engineering Division of Sunkist Growers, Inc.

TABLE 23. ESTIMATED STANDARDIZED FIXED AND VARIABLE PACKING COSTS OF CENTRAL CALIFORNIA PACKING HOUSES, 1962-63

Area and packing house number	Total fixed costs	Per unit variable costs
	dollars	dols/field box
Area 1--Sanger		
1A	81,415	.48610
Area 2--Orange Cove		
2A	43,556	.51230
2B	71,668	.44167
2C	36,612	.49840
2D	73,214	.48785
Area 3--Orosi		
3A	27,462	.56322
Area 4--Woodlake		
4A	76,260	.49633
4B	53,600	.61265
4C	23,410	.51109
4D	18,492	.57861
Area 5--Ivanhoe		
5A	46,344	.58369
5B	52,614	.60542
5C	89,574	.43762
5D	105,656	.44731
5E	91,500	.53620
Area 6--Lemon Cove		
6A	39,731	.54380
6B	46,676	.63280
6C	59,254	.59732
Area 7--Exeter		
7A	86,766	.60110
7B	70,241	.53692
7C	112,752	.43261

TABLE 23--Continued

Area and packing house number	Total fixed costs	Per unit variable costs
	dollars	dols/field box
Area 8--Lindsay		
8A	91,610	.55663
8B	46,041	.45637
8C	80,955	.46064
8D	34,261	.61745
8E	43,924	.60490
8F	83,188	.43185
8G	115,345	.42773
8H	60,479	.49250
8I	71,290	.46349
8J	69,641	.52634
8K	50,960	.58731
8L	116,940	.43691
Area 9--Strathmore		
9A	73,640	.49876
9B	60,733	.61442
9C	49,079	.44824
9D	121,600	.45629
9E	53,200	.57952
Area 10--Porterville		
10A	76,278	.57641
10B	70,600	.52346
10C	50,039	.49974
10D	39,426	.54683
10E	55,735	.49699
10F	70,444	.43610
10G	46,900	.56736
Area 11--Terra Bella		
11A	67,436	.59226
Area 12--Richgrove		
12A	26,432	.64911

currently in use in Central California. They generally may be identified as the bin-mounted two-wheeled trailer method, the boom hoist four-wheeled trailer method, the boom hoist straddle-carrier method, and the bin-mounted orchard-truck method.[16]

Studies indicate that assembly costs depend on such factors as length of haul, rate of operation at the packing house, and work method. As the volume of fruit handled in a packing house increases, the distance over which the fruit must be assembled increases. Thus, the economies of increasing packing plant size must be examined in combination with the diseconomies of increasing assembly costs. In general, bulk-handling methods result in lower per-unit assembly costs as compared with the field box method.

For purposes of this study the optimum per-unit assembly costs developed by Siebert for various areas were used as a basis for estimating assembly costs of base-year and new "model" packing houses.[17]

Siebert's optimum assembly costs by area were first deflated to reflect 1962 price levels.[18] These assembly costs are shown in Table 24. They were then adjusted to an individual packing house operation on the basis of assembly work method and packing house volume, using the adjustment factors in Table 25.[19]

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[16] Thor, Revzan and Siebert, op. cit., p. 7.

[17] Siebert, op. cit., p. 173.

[18] A deflation factor was used to deflate labor, equipment and material costs comparable to the inflation factor used in Siebert's study.

[19] These relationships of costs of handling by bulk methods and in field boxes were developed by Thor, Revzan and Siebert, op. cit., p. 1-10.

TABLE 24. ASSEMBLY COSTS PER FIELD BOX BY AREA, CENTRAL CALIFORNIA, 1962-63[a]

Area and packing house location	Per unit assembly cost 1962-63
	dols/field box
1--Sanger	.09541
2--Orange Cove	.07624
3--Orosi	.05619
4--Woodlake	.05316
5--Ivanhoe	.05629
6--Lemon Cove	.05299
7--Exeter	.05093
8--Lindsay	.05325
9--Strathmore	.04951
10--Porterville	.05974
11--Terra Bella	.05206
12--Richgrove	.08763

[a] Derived from Table 11 by converting total optimum least-cost assembly costs by area to per unit costs 1972-73 and deflating to 1962-63 cost levels.

TABLE 25. DIFFERENCE IN COST BETWEEN HANDLING BY BULK METHODS AND HANDLING IN FIELD BOXES

Packing house volume[a]	Index of cost	
	Bulk method	Field box method
A	100	109
B	100	118
C	100	124
D	100	124
E	100	125
F	100	125
G	100	125
H	100	125

[a] Code for packing house volume indicated in Table 27.

The per unit assembly cost for base-year packing house adjusted for assembly work method and packing house volume is presented in Table 26. These costs serve as the estimate of base-year assembly costs in the calculation of expansion path costs.

Plant Capacity of Base-year Packing Houses

Basic data used for the determination of plant capacity of the 47 base-year packing houses in Central California were obtained from the field survey and data and capacity standards developed by the staff of the Research and Engineering Division of Sunkist Growers, Inc.

To facilitate the designation of annual plant capacity for the base-year packing houses, eight capacity classifications were specified and designated by the letters A through H. These eight capacity designations are indicated in Table 27 and are the designations used to denote packing house size and capacity in this study.

The capacity designation for an individual packing house was based on the following assumptions:

1. The packing house had adequate dumping, washing, and packing equipment to handle the dumping rate per hour indicated.
2. The hours of operation of the packing house during the peak week were 56.
3. The seasonal pattern of navel and Valencia orange shipments was the industry average pattern shown in Table 13 and during the peak week of operations 8 per cent of the navel crop was handled.
4. The average composition of the crop handled was 72.1 per cent navels and 27.9 per cent Valencia. These percentages reflect the composition of the orange crop projected for Central California midway in the ten-year planning period.

TABLE 26. ASSEMBLY HANDLING METHOD AND ESTIMATED ASSEMBLY COST PER FIELD BOX BY PACKING HOUSE, CENTRAL CALIFORNIA, 1962-63

Area and packing house number	Assembly handling method[a]	Per unit assembly cost[b]
		dols/field box
Area 1--Sanger		
1A	Field	.11831
Area 2--Orange Cove		
2A	Field	.09454
2B	Field	.09454
2C	Field	.08996
2D	Field	.09454
Area 3--Orosi		
3A	Field	.06630
Area 4--Woodlake		
4A	Field	.06591
4B	Field	.06591
4C	Field	.05794
4D	Field	.05794
Area 5--Ivanhoe		
5A	Field	.06642
5B	Field	.06136
5C	Field	.06980
5D	Field	.06980
5E	Field	.06980
Area 6--Lemon Cove		
6A	Field	.05776
6B	Field	.05776
6C	Field	.05776
Area 7--Exeter		
7A	Field	.06010
7B	Field	.06315
7C	Bulk	.05093

TABLE 26.--Continued

Area and packing house number	Assembly handling method[a]	Per unit assembly cost[b]
		dols/field box
Area 8--Lindsay		
8A	Field	.06603
8B	Field	.06603
8C	Field	.06603
8D	Field	.05325
8E	Field	.05804
8F	Bulk	.05804
8G	Bulk	.05325
8H	Field	.06603
8I	Field	.06603
8J	Field	.06603
8K	Field	.06284
8L	Field	.06603
Area 9--Strathmore		
9A	Field	.06139
9B	Field	.06139
9C	Field	.06139
9D	Field	.06139
9E	Field	.06139
Area 10--Porterville		
10A	Field	.07049
10B	Field	.07408
10C	Field	.07408
10D	Field	.07049
10E	Field	.05974
10F	Bulk	.07408
10G	Field	.07049
Area 11--Terra Bella		
11A	Field	.06455
Area 12--Richgrove		
12A	Field	.10340

[a] _Field_ indicates field box assembly handling method. _Bulk_ indicates bulk handling method.

[b] Calculated from area assembly costs in Table 25 using handling method index in Table 24 and plant capacity data in Table 28.

TABLE 27. ORANGE PACKING HOUSE ANNUAL CAPACITY DESIGNATION

Capacity designation	Dump rate	Volume handled in 56-hr week	Annual volume of navel oranges[a]	Annual volume of navel & Valencia oranges[b]
	field boxes/hr	field boxes	field boxes	field boxes
A	250	14,000	175,000	242,718
B	500	28,000	350,000	485,436
C	750	42,000	525,000	728,154
D	1,000	56,000	700,000	970,872
E	1,250	70,000	875,000	1,213,590
F	1,500	84,000	1,050,000	1,456,308
G	1,750	98,000	1,225,000	1,699,026
H	2,000	112,000	1,400,000	1,941,744

[a] Based on 8 per cent of navel crop handled during peak week.

[b] Based on a total crop of 72.1 per cent navel and 27.9 per cent Valencia oranges.

5. The packing house had adequate sweat room and storage capacity to handle the annual capacity indicated.

The capacity designation and the corresponding annual capacity of base-year packing houses are presented in Table 28. These plant capacity ratings and district capacity ratings serve as one determinant in the calculation of expansion path costs.

Cost of Expanding Base-year Packing Houses

In order to calculate the expansion path packing cost of a plan involving the expansion of existing facilities, it was necessary to develop an estimate of fixed costs associated with increasing plant size. The procedure used to estimate these increases in fixed cost included: (1) the determination of typical modifications to existing packing house facilities of various size, (2) the estimation of the cost of plant modification, (3) the calculation of annual fixed cost associated with plant modification, and (4) the combining of these annual fixed costs with the fixed costs of labor and material associated with plant expansion.

Packing house appraisal reports, auditors' reports, and cost data of recently completed plant modifications were used as a base for estimating costs of plant modifications.[20] The increase in fixed labor, material, and miscellaneous costs was developed from cost relationships obtained in the packing house-management study. All costs of building, equipment, labor, and material were standardized at 1962 price levels.

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[20] The basic data for costs of plant modification were developed in cooperation with staff members of the Research and Engineering Division of Sunkist Growers, Inc.

TABLE 28. CAPACITY OF ORANGE PACKING HOUSES IN CENTRAL CALIFORNIA BY AREAS, 1962-63

Area and packing house number	Capacity designation[a]	Annual capacity navels & Valencias
		field boxes
Area 1--Sanger		
1A	C	728,154
Sub Total		728,154
Area 2--Orange Cove		
2A	C	728,154
2B	D	970,872
2C	B	485,436
2D	C	728,154
Sub Total		2,912,616
Area 3--Orosi		
3A	B	485,436
Sub Total		485,436
Area 4--Woodlake		
4A	B	485,436
4B	B	485,436
4C	A	242,718
4D	A	242,718
Sub Total		1,456,308
Area 5--Ivanhoe		
5A	B	485,436
5B	A	242,718
5C	D	970,872
5D	C	728,154
5E	C	728,154
Sub Total		3,155,334
Area 6--Lemon Cove		
6A	A	242,718
6B	A	242,718
6C	A	242,718
Sub Total		728,154
Area 7--Exeter		
7A	B	485,436
7B	C	728,154
7C	D	970,872
Sub Total		2,184,462

TABLE 28.--Continued

Area and packing house number	Capacity designation[a]	Annual capacity navels & Valencias
		field boxes
Area 8--Lindsay		
8A	C	728,154
8B	C	728,154
8C	D	970,872
8D	A	242,718
8E	A	242,718
8F	D	970,872
8G	C	728,154
8H	C	728,154
8I	D	970,872
8J	C	728,154
8K	B	485,436
8L	D	970,872
Sub Total		8,495,130
Area 9--Strathmore		
9A	C	728,154
9B	C	728,154
9C	C	728,154
9D	D	970,872
9E	C	728,154
Sub Total		3,883,488
Area 10--Porterville		
10A	B	485,436
10B	C	728,154
10C	C	728,154
10D	B	485,436
10E	C	728,154
10F	C	728,154
10G	B	485,436
Sub Total		4,368,924
Area 11--Terra Bella		
11A	C	728,154
Sub Total		728,154
Area 12--Richgrove		
12A	B	485,436
Sub Total		485,436
All Areas		29,611,596

[a] Code for plant capacity designation indicated in Table 27.

The increase in annual fixed cost resulting from the expansion of packing house facilities in Central California is summarized in Table 29. The capacity designations are those explained in a previous section of this chapter and indicated in Table 27.

The estimates of the increase in fixed cost related to plant expansion presented in Table 29 are additive. For example, the increase in fixed costs for a packing house expanding from a capacity A packing house (242,718 field boxes annually) to a capacity B packing house (485,436 field boxes annually) was estimated to be $18,000. If the same capacity A packing house expanded to a capacity D packing house (970,872 field boxes annually) the total increase in fixed costs was estimated to be $50,600 ($18,000 + $13,800 + $18,800 = $50,600). The high increase in total costs in expanding packing house facilities from a capacity D packing house to a capacity E packing house reflects the heavy cost of buildings and equipment required for a double-unit capacity E packing house.

Expansion Path of Production and Alternative Expansion Plans

In addition to packing house cost and operational data developed in the preceding section, detailed alternative expansion plans in terms of number and size of packing houses based on projected volume are necessary for the calculation of total assembly and packing costs. It is the purpose of this section to develop the expansion path of orange production for 12 areas in Central California during the planning period and to specify three alternative expansion plans for each area.

TABLE 29. ESTIMATED ANNUAL INCREASE IN FIXED COSTS ASSOCIATED WITH EXPANSION OF PACKING HOUSE FACILITIES FOR ORANGE PACKING HOUSES IN CENTRAL CALIFORNIA, 1962-63

Item	Increase in annual fixed costs associated with increase of capacity indicated[a]						
	Capacity A to B	Capacity B to C	Capacity C to D	Capacity D to E	Capacity E to F	Capacity F to G	Capacity G to H
				dollars			
Labor & Miscellaneous	11,000	1,800	6,800	22,000	1,800	1,800	1,800
Buildings & Equipment	7,000	12,000	12,000	41,500	12,000	12,000	12,000
TOTAL	18,000	13,800	18,800	63,500	13,800	13,800	13,800

[a] Code for plant capacity designation indicated in Table 27.

Expansion Path of Production

The expansion path of production for Central California from the base year 1962-63 to 1972-73 was derived by projecting 1962-63 orange production by areas to the theoretical long-run optimum allocation of orange production in 1972 developed by Siebert.[21] For that reason, the specification of the 12 plant locations and the projected volume of fruit allocated to each plant location or area in 1972 were predetermined for purposes of this study.

The expansion path of production by predetermined areas was made by establishing comparable area production estimates in the base year 1962-63 and comparing them with projected volumes for 1972-73. Comparable area production estimates for the base year were made by grouping base-year packing houses according to the predetermined areas and then totaling volume handled by individual packing houses within the area.[22] This total orange production by areas and plant location in 1962-63 is shown in Table 30.

The allocation of orange production by areas and plant location projected for the 1972-73 season is presented in Table 31.

The expansion path of production for each area was developed by a linear projection between the base-year production and the 1972-73 projection. The expansion paths of production for each of the 12 areas are presented in Appendix C.

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[21] Siebert, op. cit., p. 173.

[22] 1962-63 volume handled from individual packing houses was developed mainly from packing house records. Assistance was also obtained from the Marketing Order Manager who compiled confidential information in such a manner that it could be made available.

TABLE 30. ORANGE PRODUCTION BY AREA AND PLANT LOCATION, CENTRAL CALIFORNIA, 1962-63[a]

Area and plant location	Production Navel	Production Valencia	Total production
		field boxes	
1--Sanger	369,097	76,945	446,042
2--Orange Cove	1,086,433	628,859	1,715,292
3--Orosi	107,364	18,645	126,009
4--Woodlake	296,203	117,210	413,413
5--Ivanhoe	1,484,984	469,854	1,954,838
6--Lemon Cove	248,883	72,416	321,299
7--Exeter	1,202,537	461,751	1,664,288
8--Lindsay	3,491,863	1,254,766	4,746,629
9--Strathmore	1,067,170	555,921	1,623,091
10--Porterville	1,440,268	442,112	1,882,380
11--Terra Bella	277,464	108,766	386,230
12--Richgrove	72,696	-	72,696
TOTAL	11,144,962	4,207,245	15,352,207

[a] Actual 1962-63 production by area and plant location adjusted to normal crop level.

Source: Navel and Valencia Orange Administrative Committee, Los Angeles, California.

TABLE 31. ALLOCATION OF PROJECTED NAVEL AND VALENCIA ORANGE PRODUCTION BY AREA AND PLANT LOCATION, CENTRAL CALIFORNIA, 1972-73[a]

Area and plant location	Production		Total production
	Navel	Valencia	
		field boxes	
1--Sanger	1,399,055	429,925	1,828,930
2--Orange Cove	4,099,692	947,694	5,047,386
3--Orosi	1,394,338	798,925	2,193,263
4--Woodlake	1,385,725	803,084	2,188,809
5--Ivanhoe	2,768,181	1,352,141	4,120,322
6--Lemon Cove	1,380,211	396,869	1,777,080
7--Exeter	1,363,734	790,348	2,154,082
8--Lindsay	2,345,092	888,979	3,234,071
9--Strathmore	2,393,792	1,559,114	3,952,906
10--Porterville	1,378,566	774,077	2,152,643
11--Terra Bella	2,774,572	1,603,329	4,377,901
12--Richgrove	2,050,366	1,376,934	3,427,300
TOTAL	24,733,274	11,721,419	36,454,693

[a] Optimum allocation by areas and plant location as defined in source, p. 173.

Source: Jerome B. Siebert, "Long Range Adjustments of Orange Packing Houses in Central California: A Consideration of the Optimum Number, Size, and Location of Packing Facilities" (unpublished Ph.D. dissertation, University of California, Berkeley, 1964), p. 173.

Alternative Area Expansion Plans

Three ten-year expansion plans were specified for packing house facilities in each of the 12 areas of Central California.[23] Expansion plans termed Alternative 1 for each area were plans which tended to maintain the base-year status quo in terms of packing house numbers. Alternative 3 plans considered the largest number of packing house consolidations and new plant capacity. Alternative 2 plans were selected to represent adjustments in packing house number and size between these alternative plans. In the specification of alternative expansion plans consideration was given to a number of factors. They included: (1) plant efficiency; (2) management, (3) financial structure; (4) organization; and (5) type of marketing agency.

A description of each alternative expansion plan is included in Chapter VI. The specific detail of each plan is presented in Appendix C. These tables include the following information:

1. The number and identity of packing houses considered in each alternative plan.
2. The projected annual volume of fruit handled by each packing house by years during the planning period.
3. The capacity rating of each packing house by years during the planning period.
4. The year specified base-year packing houses were closed and consolidated with other facilities.
5. The year specified base-year packing houses expanded plant capacity to handle increased volume of fruit.
6. The year new packing house facilities were constructed.

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[23] These plans were selected in consultation with staff members of the Research and Engineering Division of Sunkist Growers, Inc., packing house manager, growers, and other industry representatives.

The procedures used to allocate projected volumes for individual packing houses included the following ground rules. Where area packing house capacity exceeded the volume of fruit projected, the volume was prorated among packing houses on the basis of volume handled by each packing house during the base year 1962-63. This allocation was maintained during the first five years of the planning period through the 1966-67 season. Thereafter, the projected volume was allocated equally between packing houses considered under the alternative plan. In addition, during the tenth year a total projected volume for the area was allowed to exceed the rated capacity of all packing houses considered in the alternative by 15 per cent. In practice, packing houses can exceed rated capacity by crowding equipment and increasing hours of operation even though this may increase costs.

Calculation of Expansion Path Cost

Previous sections have shown the method and development of (1) packing house cost and operational data for base-year packing houses and new "model" packing houses and (2) alternative expansion plans for individual packing houses during the ten-year planning period. The calculation of the expansion path cost was essentially a budgetary process of applying packing house cost data to the specification of a particular expansion plan. The process, however, was complex because of the many cost variables, alternative plans, the calculations necessary to reflect inflationary cost increases in the factors of production, and the discounting of expansion path cost to base-year values.

Ground Rules

The procedure used to calculate expansion path cost included a number of "ground rules." These were as follows:

1. Assembly and packing costs of all packing houses were adjusted during the ten-year planning period by an inflation factor which reflected a 3 per cent increase per year in the cost of labor and a 1 per cent increase per year in the cost of building, equipment, and material.[24]
2. When an existing base-year packing house expanded facilities above capacity rating C, the assembly cost for the bulk-handling method was used.
3. When an existing base-year packing house expanded facilities above capacity rating C, the variable packing cost for new "model" packing houses was used.
4. When an existing base-year packing house expanded capacity, total fixed costs for the year of expansion were determined by adding the fixed costs of the original plant inflated to the expansion year to the inflated increase in fixed cost of expanding plant facilities.
5. When base-year packing houses were closed, it was assumed they could be sold for book value and end with no debts or capital gains.
6. Total expansion path costs were discounted to base-year values at a rate of 6 per cent interest.

Inflation Factors for Assembly and Packing Costs

Per unit assembly costs for individual packing houses were increased at a rate of 1.72 per cent per year for bulk-handling methods and

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[24] This expectation of an inflationary increase in the cost of labor, equipment, and material is based on information used in a series of confidential reports to the citrus industry on reorganization of existing packing house facilities by Eric Thor, Jerome Siebert and Robert C. Rock of the Giannini Foundation of Agricultural Economics, University of California, Berkeley and Riverside.

2.79 per cent per year for field box handling methods.[25] The higher rate of increase for the field box method reflects the larger proportion of labor costs to equipment costs as compared with bulk-handling methods.

Per unit variable packing house costs were increased at a rate of 1.66 per cent per year for all packing houses. An analysis of the proportion of variable labor costs to variable building, equipment, and material costs indicated they did not vary significantly by size of plant operations. The proportion of fixed labor cost to fixed building, equipment, and material cost did vary with size of packing house operation and a schedule of adjustment factors was developed.[26] These inflation adjustment factors for fixed costs for operating packing houses and new packing house facilities constructed during the planning period are shown in Table 32.

TABLE 32. INFLATION ADJUSTMENTS FOR FIXED PACKING COSTS

Packing house capacity or size[a]	Increase	Increase prior to construction
	per cent	
A and B	1.79	2.09
C and D	1.76	2.05
E and F	1.65	2.01
G and H	1.59	1.95

[a] For capacity designation, see Table 27.

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[25] This adjustment factor was developed from cost relationships reported by Thor, Revzan, and Siebert, op. cit., Chapter II.

[26] These adjustment factors were developed from cost relationships of varying size plants reported by Siebert, op. cit., pp. 62-107.

Base-year Value Adjustment

For planning purposes it should be noted that dollars of different dates are not identical in economic meaning so that the summation of costs over a planning period is not significant.[27] Accordingly, the total annual costs of assembly and packing for each alternative in this study were discounted from the year the costs were incurred to the base-year at an interest rate of 6 per cent. This discounted cost (1962 value) of total assembly and packing costs by alternative plans is presented in Table 34.

Expension Path Cost Calculations

Calculations of packing house expansion path costs and the summation of these costs by area and alternative plan were carried out with the use of an IBM 1620 digital computer. An illustration of the cost calculation involved in the determination of the expansion path cost for a specific packing house is presented in Appendix B. Summaries of annual total assembly cost, total fixed and variable packing cost, total assembly and packing cost by area and alternative plan are presented in Appendix D.

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[27] A. G. Hart, Anticipations, Uncertainty, and Dynamic Planning (New York: Augustus M. Kelley, Inc., 1951), p. 14.

CHAPTER VI

THE LEAST-COST EXPANSION PATH, 1962-63 TO 1972-73

The theoretical framework, data and method of analysis necessary for the determination of the least-cost expansion path of orange packing house costs in Central California during the ten-year planning period have been developed in previous chapters. An analysis of total assembly and packing costs for 36 alternative expansion plans for 12 areas in Central California and the selection of the least-cost set of alternative plans are the purposes of this chapter.

The chapter is divided into two sections. The first analyzes area alternative expansion plans and total assembly and packing costs. Specific details of each alternative plan and estimates of total annual assembly and packing costs are presented in Appendices C and D. The second is devoted to the analysis of the least-cost set of area alternative plans.

Area 1--Sanger

Production in Area 1 was projected to increase from 446,042 field boxes in 1962-63 to 1,828,930 field boxes in 1972-73. In 1962 there was one packing house in the area with an annual capacity of 728,154 field boxes. Projections of area production exceeded this capacity after the 1964-65 season.

Alternative Plans Considered

Alternative 1.--The base-year packing house was operated without change in plant capacity during the ten-year planning period. Beginning with the 1965-66 season, a new double unit packing house with a capacity of 1,213,590 field boxes was constructed and operated.

Alternative 2.--The base-year packing house was operated without change in plant capacity through the 1964-65 season and then was expanded to a capacity of 970,872 field boxes for the 1965-66 season. A new packing house with a capacity of 970,872 field boxes was constructed and operated at the start of the 1966-67 season.

Alternative 3.--The base-year packing house was operated without change in plant capacity through the 1964-65 season. Following this season the packing house was closed, and a new double unit packing house with a capacity of 1,941,744 field boxes was constructed and operated at the beginning of the 1965-66 season.

Expansion Path Costs

The least-cost alternative plan for Area 1 was Alternative 3 with a total assembly and packing cost for the planning period of $9,468,418 as compared with a cost of $9,503,386 for Alternative 2 and $10,614,442 for Alternative 1.

Area 2--Orange Cove

Production in Area 2 was projected to increase from 1,715,292 field boxes in 1962-63 to 5,047,386 field boxes in 1972-73. In 1962 there were four packing houses in the area with a combined annual capacity of 2,912,616 field boxes. Projections of area production exceeded this capacity after the 1965-66 season.

Alternative Plans Considered

Alternative 1.--The four base-year packing houses were operated without change in plant capacity during the ten-year planning period. A new double unit packing house with a capacity of 1,941,744 field boxes was constructed and operated for the first time in the 1966-67 season.

Alternative 2.--Two of the four base-year packing houses were operated without change in plant capacity during the ten-year planning period. Another was operated without change in plant capacity through the 1965-66 season, and then was expanded to a capacity of 1,941,744 field boxes beginning with the 1966-67 season. The remaining packing house was operated without change in plant capacity through the 1968-69 season. Beginning with the 1969-70 season, it was expanded to a capacity of 1,941,744 field boxes.

Alternative 3.--The four base-year packing houses were operated without change in plant capacity through the 1965-66 season. Following this season two were closed and the two remaining packing houses were expanded to double line operations, each with a capacity of 1,941,744 field boxes. A new double unit packing house with a capacity of 1,699,026 field boxes was constructed and began operations during the 1969-70 season.

Expansion Path Costs

The least-cost alternative plan for Area 2 was Alternative 3 with a total assembly and packing cost for the planning period of $25,858,577 as compared with a cost of $26,369,843 for Alternative 2 and $27,337,749 for Alternative 1.

Area 3--Orosi

Production in Area 3 was projected to increase from 126,009 field boxes in 1962-63 to 2,193,263 field boxes in 1972-73. In 1962 there was one packing house in the area with an annual capacity of 485,436 field boxes. Projections of area production exceeded this capacity after the 1963-64 season.

Alternative Plans Considered

Alternative 1.--The base-year packing house was operated without change in plant capacity during the ten-year planning period. A new double unit packing house with a capacity of 1,941,744 field boxes was constructed and operated initially during the 1964-65 season.

Alternative 2.--The base-year packing house was operated without change in plant capacity through the 1963-64 season and then was expanded to a capacity of 970,872 field boxes for the 1964-65 season. Beginning with the 1967-68 season, a new packing house with a capacity of 970,872 field boxes was constructed and operated.

Alternative 3.--The base-year packing house was operated without change in plant capacity through the 1963-64 season. Following this season the packing house was closed and a new double unit packing house with a capacity of 1,943,744 field boxes was constructed and operated for the first time during the 1964-65 season.

Expansion Path Costs

The least-cost alternative plan for Area 3 was Alternative 2 with a total assembly and packing cost for the planning period of $8,450,092 as compared with a cost of $9,046,198 for Alternative 3 and $10,073,747 for Alternative 1.

Area 4--Woodlake

Production in Area 4 was projected to increase from 413,413 field boxes in 1962-63 to 2,188,809 field boxes in 1972-73. In 1962 there were four packing houses in the area with a combined annual capacity of 1,456,308 field boxes. Projections of area production exceeded this capacity after the 1967-68 season.

Alternative Plans Considered

Alternative 1.--The four base-year packing houses were operated without change in plant capacity during the ten-year planning period. Beginning with the 1968-69 season, a new packing house with a capacity of 728,154 field boxes was constructed and operated.

Alternative 2.--The four base-year packing houses were operated without change in plant capacity through the 1964-65 season. Following this season two packing houses were closed and the remaining two packing houses were expanded to a capacity of 970,872 field boxes for each plant.

Alternative 3.--The four base-year packing houses were operated without change in plant capacity through the 1964-65 season. Following this season all four packing houses were closed and a new double unit packing house with a capacity of 1,941,744 field boxes was constructed and operated initially during the 1965-66 season.

Expansion Path Costs

The least-cost alternative plan for Area 4 was Alternative 2 with a total assembly and packing cost for the planning period of $9,784,215 as compared with a cost of $10,198,588 for Alternative 3 and $12,223,097 for Alternative 1.

Area 5--Ivanhoe

Production in Area 5 was projected to increase from 1,954,838 field boxes in 1962-63 to 4,120,322 field boxes in 1972-73. In 1962 there were five packing houses in the area with a combined annual capacity of 3,155,334 field boxes. Projections of area production exceeded this capacity after the 1967-68 season.

Alternative Plans Considered

Alternative 1.--Three of the five base-year packing houses were operated without change in plant capacity during the ten-year planning period. One of the packing houses was operated without change in capacity through the 1967-68 season and then was expanded to a capacity of 970,872 field boxes beginning with the 1968-69 season. The remaining packing house was operated without change in capacity through the 1968-69 season and then was expanded to a capacity of 728,154 field boxes for operations during the 1969-70 season.

Alternative 2.--Two of the five base-year packing houses were closed during the ten-year planning period. One was operated without change in plant capacity during the ten-year planning period. The remaining two packing houses were operated without change in plant capacity through the 1963-64 season. Following this season these two packing houses were expanded to two double unit operations, each with a capacity of 1,941,744 field boxes at the start of the 1964-65 season.

Alternative 3.--Two of the five base-year packing houses were closed during the ten-year planning period. The remaining three packing houses were operated without change in plant capacity through the 1963-64 season. Following this season these three packing houses were closed and two new double unit packing houses, each with a capacity of 1,941,744 field boxes, were constructed and operated initially in the 1964-65 season.

Expansion Path Costs

The least-cost alternative plan for Area 5 was Alternative 3 with a total assembly and packing cost for the planning period of $22,512,260. This compared with a cost of $23,727,548 for Alternative 2 and $24,821,540 for Alternative 1.

Area 6--Lemon Cove

Production in Area 6 was projected to increase from 321,299 field boxes in 1962-63 to 1,777,080 field boxes in 1972-73. In 1962 there were three packing houses in the area with a combined annual capacity of 728,154 field boxes. Projections of area production exceeded this capacity after the 1964-65 season.

Alternative Plans Considered

Alternative 1.--One of the three base-year packing houses was operated without change in plant capacity during the ten-year planning period. Another was operated without change in plant capacity through the

1964-65 season and then was expanded to a capacity of 970,872 field boxes beginning with the 1965-66 season. The remaining packing house was operated without change in capacity through the 1969-70 season, and was then expanded to a capacity of 728,154 field boxes for the 1970-71 and succeeding seasons.

Alternative 2.--One of the three base-year packing houses was closed for the ten-year planning period. Another was operated without change in plant capacity through the 1964-65 season and then was expanded to a capacity of 970,872 field boxes beginning with the 1965-66 season. The remaining packing house was operated without change in capacity through the 1963-64 season. Beginning with 1964-65 season, it was expanded to a capacity of 970,872 field boxes.

Alternative 3.--The three base-year packing houses were operated without change in plant capacity through the 1964-65 season. Following this season all three were closed and a new double unit packing house with a capacity of 1,699,026 field boxes was constructed and operated initially during the 1965-66 season.

Expansion Path Costs

The least-cost alternative plan for Area 6 was Alternative 2 with a total assembly and packing cost for the planning period of $8,310,948 as compared with a cost of $8,587,583 for Alternative 3 and $9,328,543 for Alternative 1.

Area 7--Exeter

Production in Area 7 was projected to increase from 1,664,288 field boxes in 1962-63 to 2,154,082 field boxes in 1972-73. In 1962 there were three packing houses in the area with a combined annual capacity of 2,184,462 field boxes. This area capacity exceeded projected area production for all years of the ten-year planning period.

Alternative Plans Considered

Alternative 1.--The three base-year packing houses were operated without change in plant capacity during the ten-year planning period.

Alternative 2.--One of the three base-year packing houses was operated without change in plant capacity during the ten-year planning period. Another was closed for the ten-year planning period and the third packing house was expanded to a capacity of 970,872 field boxes at the beginning of the 1963-64 season.

Alternative 3.--Two of the three base-year packing houses were closed during the ten-year planning period. The third was expanded to a double unit operation with a capacity of 1,941,744 field boxes for the ten-year planning period.

Expansion Path Costs

The least-cost alternative plan for Area 7 was Alternative 3 with a total assembly and packing cost for the planning period of $13,335,045 as compared with a cost of $13,483,777 for Alternative 2 and $15,829,956 for Alternative 1.

Area 8--Lindsay

Production in Area 8 was projected to decrease from 4,746,629 field boxes in 1962-63 to 3,234,071 field boxes in 1972-73. In 1962 there were 12 packing houses in the area with a combined annual capacity of 8,495,130 field boxes. This area capacity exceeded projected area production for all years of the ten-year planning period.

Alternative Plans Considered

Alternative 1.--The 12 base-year packing houses were operated without change in plant capacity during the ten-year planning period.

Alternative 2.--Six of the 12 base-year packing houses were operated without change in plant capacity during the ten-year planning period. The remaining six packing houses were closed for the ten-year planning period.

Alternative 3.--Six of the 12 base-year packing houses were closed during the ten-year planning period. Four were operated without change in plant capacity through the 1967-68 season and then were closed. One was operated without change in capacity during the ten-year planning period. The remaining packing house was operated without change in capacity through the 1967-68 season. Beginning with the 1968-69 season, it was expanded to a double unit operation with a capacity of 1,699,026 field boxes.

Expansion Path Costs

The least-cost alternative plan for Area 8 was Alternative 3 with a total assembly and packing cost for the planning period of $28,772,695 as compared with a cost of $30,259,051 for Alternative 2 and $35,702,536 for Alternative 1.

Area 9--Strathmore

Production in Area 9 was projected to increase from 1,623,091 field boxes in 1962-63 to 3,952,906 field boxes in 1972-73. In 1962 there were five packing houses in the area with a combined annual capacity of 3,883,488 field boxes. Projections of area production exceeded this capacity after the 1971-72 season.

Alternative Plans Considered

Alternative 1.--The five base-year packing houses were operated without change in plant capacity during the ten-year planning period.

Alternative 2.--Two of the five base-year packing houses were closed during the ten-year planning period. The remaining three were expanded. One packing house was expanded to a capacity of 970,872 field boxes beginning with the 1966-67 season. One was expanded to a capacity of 970,872 field boxes in the 1970-71 season and the remaining packing house was expanded to a double unit operation with a capacity of 1,941,744 field boxes effective with the 1964-65 season.

Alternative 3.--Four of the five base-year packing houses were closed during the ten-year planning period. The remaining packing house was expanded to a double unit operation with a capacity of 1,941,744 field boxes beginning with the 1964-65 season. A new double unit packing house with a plant capacity of 1,941,744 field boxes was constructed and began operations at the beginning of the 1962-63 season.

Expansion Path Costs

The least-cost alternative plan for Area 9 was Alternative 2 with a total assembly and packing cost for the planning period of $20,551,362. This compared with a cost of $20,971,964 for Alternative 3 and $23,709,017 for Alternative 1.

Area 10--Porterville

Production in Area 10 was projected to increase from 1,882,380 field boxes in 1962-63 to 2,152,643 field boxes in 1972-73. In 1962 there were seven packing houses in the area with a combined annual capacity of 4,368,924 field boxes. This area capacity exceeded projected area production for all years of the ten-year planning period.

Alternative Plans Considered

Alternative 1.--The seven base-year packing houses were operated without change in plant capacity during the ten-year planning period.

Alternative 2.--Four of the seven base-year packing houses were closed during the ten-year planning period. The remaining three packing houses were operated without change in plant capacity during the ten-year planning period.

Alternative 3.--Six of the seven base-year packing houses were closed during the ten-year planning period. Beginning with the 1962-63 season, the remaining packing house was expanded to a double unit operation with a capacity of 1,941,744 field boxes.

Expansion Path Costs

The least-cost alternative plan for Area 10 was Alternative 3 with a total assembly and packing cost for the planning period of $14,113,074 as compared with a cost of $15,899,321 for Alternative 2 and $19,140,448 for Alternative 1.

Area 11--Terra Bella

Production in Area 11 was projected to increase from 386,230 field boxes in 1962-63 to 4,377,901 field boxes in 1972-73. In 1962 there was one packing house in the area with an annual capacity of 728,154 field boxes. Projections of area production exceeded this capacity after the 1962-63 season.

Alternative Plans Considered

Alternative 1.--The base-year packing house was operated without change in plant capacity during the ten-year planning period, and two new packing houses were constructed. One new double unit packing house with a capacity of 1,941,744 field boxes was constructed and operated beginning with the 1963-64 season. The second new double unit packing house with a capacity of 1,941,744 field boxes was constructed and operated initially during the 1968-69 season.

Alternative 2.--The base-year packing house was expanded beginning with the 1963-64 season, to a double unit operation with a capacity of 1,941,744 field boxes. A new double unit packing housewith a capacity of 1,941,744 field boxes was constructed and operations begun during the 1966-67 season.

Alternative 3.--The base-year packing house was closed during the ten-year planning period and two new packing houses were constructed. Both new packing houses were double unit operations, each with a capacity of 1,941,744 field boxes. One packing house began operations with the 1962-63 season and the other with the 1966-67 season.

Expansion Path Costs

The least-cost alternative plan for Area 11 was Alternative 2 with a total assembly and packing cost for the planning period of $17,692,412. This compared with a cost of $18,038,528 for Alternative 3 and $19,691,258 for Alternative 1.

Area 12--Richgrove

Production in Area 12 was projected to increase from 72,696 field boxes in 1962-63 to 3,427,300 field boxes in 1972-73. In 1962 there was one packing house in the area with an annual capacity of 485,436 field boxes. Projections of area production exceeded this capacity after the 1963-64 season.

Alternative Plans Considered

Alternative 1.--The base-year packing house was operated without change in plant capacity and two new packing houses were constructed during the ten-year planning period. One new double unit packing house with a capacity of 1,941,744 field boxes was constructed and operations initiated at the beginning of the 1964-65 season. The second new double unit packing house with a capacity of 1,456,308 field boxes was constructed and operations begun at the start of the 1970-71 season.

Alternative 2.--The base-year packing house was operated without change through the 1964-65 season and then was expanded to a plant capacity of 970,872 field boxes. Two new packing houses were constructed; one with a capacity of 970,872 field boxes began operations with the 1965-66 season. The second new packing house with a capacity of 1,456,308 field boxes began operations with the 1968-69 season.

Alternative 3.--The base-year packing house was closed, and two new double unit packing houses were constructed during the ten-year planning period. One new packing house with a capacity of 1,941,744 field boxes began operations with the 1962-63 season. The remaining new packing house with a capacity of 1,456,308 field boxes began operations with the 1968-69 season.

Expansion Path Costs

The least-cost alternative plan for Area 12 was Alternative 2 with a total assembly and packing cost for the planning period of $14,215,889 as compared with a cost of $14,637,472 for Alternative 3 and $16,261,959 for Alternative 1.

The Least-cost Expansion Path

In the preceding section three alternative expansion plans were analyzed for each of 12 areas in Central California. A summary of assembly and packing costs for each alternative expansion plan is presented in Table 33. These costs show that the total cost for the set of least-cost alternative plans for the 12 areas was $193,064,982. The total cost for the set of high-cost alternative plans was $224,734,292. The difference

TABLE 33. TOTAL COST OF ASSEMBLY AND PACKING ORANGES BY AREA AND ALTERNATIVE EXPANSION PLAN IN CENTRAL CALIFORNIA, 1962-63 TO 1972-73

Area and plant location	Total assembly and packing cost			Least cost alternatives	High cost alternatives	Difference
	Alternative 1	Alternative 2	Alternative 3	Total cost	Total cost	Total cost
				dollars		
Area 1--Sanger	10,614,442	9,503,386	9,468,413	9,468,413	10,614,442	1,146,029
Area 2--Orange Cove	27,337,749	26,369,843	25,858,577	25,858,577	27,337,749	1,479,172
Area 3--Orosi	10,073,747	8,450,092	9,046,198	8,450,092	10,073,747	1,623,655
Area 4--Woodlake	12,223,097	9,784,215	10,198,588	9,784,215	12,223,097	2,438,882
Area 5--Ivanhoe	24,821,540	23,727,548	22,512,260	22,512,260	24,821,540	2,309,280
Area 6--Lemon Cove	9,328,543	8,310,948	8,587,583	8,310,948	9,328,543	1,017,595
Area 7--Exeter	15,829,956	13,483,777	13,335,045	13,335,045	15,829,956	2,494,911
Area 8--Lindsay	35,702,536	30,259,051	28,772,695	28,772,695	35,702,536	6,929,841
Area 9--Strathmore	23,709,017	20,551,362	20,971,964	20,551,362	23,709,017	3,157,655
Area 10--Porterville	19,140,448	15,899,321	14,113,074	14,113,074	19,140,448	5,027,374
Area 11--Terra Bella	19,691,258	17,692,412	18,038,528	17,692,412	19,691,258	1,998,846
Area 12--Richgrove	16,261,959	14,215,889	14,637,472	14,215,889	16,261,959	2,046,070
TOTAL	224,734,292	198,247,844	195,540,397	193,064,982	224,734,292	31,669,310

between the high-cost expansion path and the least-cost expansion path was $31,669,310. The annual total assembly and packing costs for each alternative plan are shown in Appendix D.

For planning purposes the expansion path costs over the ten-year planning period were discounted to base-year or 1962 values at the rate of 6 per cent interest. A summary of total discounted assembly and packing costs for each alternative expansion plan is presented in Table 34. These discounted costs show that the total cost for the set of least-cost alternative plans for the 12 areas in Central California was $139,615,196. The total cost for the set of high-cost alternative plans was $162,440,958. The difference between the high-cost expansion path and the least-cost expansion path was $22,825,762.

The number of packing houses each year in the least-cost alternative plan is indicated in Table 35. A summary of the number of base-year packing houses, the number indicated under the least-cost expansion path, the number indicated under the high-cost expansion path and the optimum number developed by Siebert is presented in Table 36.[1]

The number of packing houses in 1972 indicated under the least-cost expansion path was 24 packing houses as compared with the actual number of 47 in the base year 1962-63. This decline in the total number of packing houses and their location by areas within Central California reflects future adjustments in a real world sense with consideration given to both fixed and variable costs of packing house facilities as the industry adjusts toward the long-run optimum solution.[2]

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[1] Optimum solution of 19 packing houses developed by Siebert, _op. cit_., p. 173.

[2] Siebert, _op. cit_., p. 173.

TABLE 34. TOTAL DISCOUNTED COST (1962 VALUE) OF ASSEMBLY AND PACKING ORANGES BY AREA AND ALTERNATIVE EXPANSION PLAN IN CENTRAL CALIFORNIA, 1962-63 TO 1972-73[a]

Area and plant location	Total assembly and packing cost Alternative 1	 Alternative 2	 Alternative 3	Least-cost alternatives Total cost	High-cost alternatives Total cost	Difference Total cost
			dollars			
Area 1--Sanger	7,495,150	6,711,374	6,709,873	6,709,873	7,495,150	785,277
Area 2--Orange Cove	19,523,040	18,863,141	18,483,630	18,483,630	19,523,040	1,039,410
Area 3--Orosi	6,959,244	5,752,421	6,231,769	5,752,421	6,959,244	1,206,823
Area 4--Woodlake	8,594,978	6,975,610	7,263,955	6,975,610	8,594,978	1,619,368
Area 5--Ivanhoe	18,115,554	17,254,615	16,394,172	16,394,172	18,115,554	1,721,382
Area 6--Lemon Cove	6,626,917	5,873,656	6,114,603	5,873,656	6,626,917	753,261
Area 7--Exeter	11,759,883	10,050,222	9,924,933	9,924,933	11,759,883	1,834,950
Area 8--Lindsay	27,315,559	23,184,196	22,248,346	22,248,346	27,315,559	5,067,213
Area 9--Strathmore	17,112,890	14,888,373	15,201,504	14,888,373	17,112,890	2,224,517
Area 10--Porterville	14,325,803	11,891,634	10,557,428	10,557,428	14,325,803	3,768,375
Area 11--Terra Bella	13,628,861	12,184,191	12,458,273	12,184,191	13,628,861	1,444,670
Area 12--Richgrove	10,983,079	9,622,563	9,993,395	9,622,563	10,983,079	1,360,516
TOTAL	162,440,958	143,251,996	141,581,881	139,615,196	162,440,958	22,825,762

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[a] Present value (1962) of costs was obtained by discounting at 6 per cent interest the annual components of the ten-year totals.

TABLE 35. NUMBER OF ORANGE PACKING HOUSES BY AREA AND ALTERNATIVE EXPANSION PLAN IN CENTRAL CALIFORNIA, 1962-63 TO 1972-73[a]

Area and alternative plan	1962-63	1963-64	1964-65	1965-66	1966-67	1967-68	1968-69	1969-70	1970-71	1971-72	1972-73
Area 1--Sanger											
Alternative 1	1	1	1	2	2	2	2	2	2	2	2
2	1	1	1	1	2	2	2	2	2	2	2
3	1	1	1	1	1	1	1	1	1	1	1
Area 2--Orange Cove											
Alternative 1	4	4	4	4	5	5	5	5	5	5	5
2	4	4	4	4	4	4	4	4	4	4	4
3	4	4	4	4	2	2	2	3	3	3	3
Area 3--Orosi											
Alternative 1	1	1	2	2	2	2	2	2	2	2	2
2	1	1	1	1	1	2	2	2	2	2	2
3	1	1	1	1	1	1	1	1	1	1	1
Area 4--Woodlake											
Alternative 1	4	4	4	4	4	4	5	5	5	5	5
2	4	4	4	2	2	2	2	2	2	2	2
3	4	4	4	1	1	1	1	1	1	1	1
Area 5--Ivanhoe											
Alternative 1	5	5	5	5	5	5	5	5	5	5	5
2	3	3	3	3	3	3	3	3	3	3	3
3	3	3	2	2	2	2	2	2	2	2	2
Area 6--Lemon Cove											
Alternative 1	3	3	3	3	3	3	3	3	3	3	3
2	2	2	2	2	2	2	2	2	2	2	2
3	3	3	3	1	1	1	1	1	1	1	1

TABLE 35.--Continued

Area and alternative plan	1962-63	1963-64	1964-65	1965-66	1966-67	1967-68	1968-69	1969-70	1970-71	1971-72	1972-73
Area 7--Exeter											
Alternative 1	3	3	3	3	3	3	3	3	3	3	3
2	2	2	2	2	2	2	2	2	2	2	2
3	1	1	1	1	1	1	1	1	1	1	1
Area 8--Lindsay											
Alternative 1	12	12	12	12	12	12	12	12	12	12	12
2	6	6	6	6	6	6	6	6	6	6	6
3	6	6	6	6	6	6	2	2	2	2	2
Area 9--Strathmore											
Alternative 1	5	5	5	5	5	5	5	5	5	5	5
2	3	3	3	3	3	3	3	3	3	3	3
3	2	2	2	2	2	2	2	2	2	2	2
Area 10--Porterville											
Alternative 1	7	7	7	7	7	7	7	7	7	7	7
2	3	3	3	3	3	3	3	3	3	3	3
3	1	1	1	1	1	1	1	1	1	1	1
Area 11--Terra Bella											
Alternative 1	1	2	2	2	2	2	3	3	3	3	3
2	1	1	1	1	2	2	2	2	2	2	2
3	1	1	1	1	2	2	2	2	2	2	2
Area 12--Richgrove											
Alternative 1	1	1	2	2	2	2	2	2	3	3	3
2	1	1	1	2	2	2	3	3	3	3	3
3	1	1	1	1	1	1	2	2	2	2	2

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[a] Number of packing houses in least-cost alternative are underlined.

TABLE 36. NUMBER OF ORANGE PACKING HOUSES IN CENTRAL CALIFORNIA 1962 AND NUMBER INDICATED IN 1972 UNDER LEAST-COST EXPANSION PATH, HIGH-COST EXPANSION PATH AND OPTIMUM[a]

Area and plant location	Number of packing houses			
	Actual 1962	Least-cost exp. path 1972	High-cost exp. path 1972	Optimum[a] cost 1972
Area 1--Sanger	1	1	2	1
Area 2--Orange Cove	4	3	5	3
Area 3--Orosi	1	2	2	1
Area 4--Woodlake	4	2	5	1
Area 5--Ivanhoe	5	2	5	2
Area 6--Lemon Cove	3	2	3	1
Area 7--Exeter	3	1	3	1
Area 8--Lindsay	12	2	12	2
Area 9--Strathmore	5	3	5	2
Area 10--Porterville	7	1	7	1
Area 11--Terra Bella	1	2	3	2
Area 12--Richgrove	1	3	3	2
TOTAL	47	24	55	19

[a] Jerome B. Siebert, "Long Range Adjustments of Orange Packing Houses in Central California: A Consideration of the Optimum Number, Size, and Location of Packing Facilities" (unpublished Ph.D. dissertation, University of California, Berkeley, 1964), p. 173.

CHAPTER VII

SUMMARY AND CONCLUSIONS

Central California, defined in this study as the California counties of Kern, Tulare, Fresno, and Madera, is a district of expanding orange acreage and production. Projections indicate orange production will double by 1972. Expanded packing house facilities will be required to handle this increased volume.

A major problem facing the Central California orange industry is one of planning the expansion of packing house facilities to handle adequately this increased volume of fruit at minimum assembly and packing costs. A district study of packing house facilities in Central California is necessary to provide sound guide lines for future adjustment.

This dissertation was a study in facilities planning for existing and new orange packing houses in Central California for the ten-year planning period 1962-63 to 1972-73. The specific objective was to develop a district plan in terms of packing house number, size, type, and location which would approach the least-cost expansion path of total assembly and packing costs during the planning period.

The study was made in a real world context. The season 1962-63, with existing packing house facilities in Central California, served as a base year for cost projections. Consideration was given to both fixed and variable costs of existing and new packing house facilities and inflationary increases in labor, equipment, and material costs anticipated during the planning period.

The Central California orange production district was divided into 12 areas identified by plant location. For each of the 12 areas an expansion path of production was projected, annually, for the ten-year planning period. Three feasible alternative expansion plans in terms of packing house expansion, consolidation, and the construction of new facilities were selected for each area. Total assembly and packing costs were then calculated for each alternative area expansion plan and the least-cost set of area expansion plans was aggregated to determine the least-cost expansion plan for the Central California district.

The results of the study indicate that under the assumptions specified the Central California orange packing industry could approach minimum assembly and packing costs by adjusting from 47 packing houses in 1962-63 toward 24 packing houses in 1972-73. The reduction in the number of packing houses would require that some packing houses be expanded to larger operations, some new units be built, and many of the older and smaller plants be closed.

Total assembly and packing costs of the least-cost set of area expansion plans totaled $193,064,637 for the ten-year planning period. The total cost of the high-cost set of area expansion plans was $224,727,024. Discounted to base-year (1962) value, total assembly and packing costs for the least-cost expansion plan for the Central California district amounted to $139,440,958. The difference between the least-cost and high-cost expansion plans discounted to base-year value was $22,825,762 for the ten-year planning period.

These results do not preclude the possibility that under alternative assumptions a different least-cost expansion path could be developed. This expansion path could conceivably involve a cost below the least-cost expansion path cost estimate of $139,440,958 developed in this study.

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APPENDICES

APPENDIX A

OUTLINE OF PACKING HOUSE DATA

PACKING HOUSE DATA COLLECTED

I. Volume Handled

  A. Volume handled by variety, 1962-63

  B. Pack out ratio, 1962-63

II. Organization and Work Methods

  A. Management and supervision

  B. Field operations

    1. Type of handling method--field box or bulk

    2. Picking crews--number and size

    3. Characteristics of orchard--method of cultivation, tree spacing, drive row width and length of haul to packing house

  C. Receiving and packing operation

    1. Method of receiving, dumping, washing, waxing, and fruit treatment

    2. Number of fruit separations and method of sizing and packing

III. Description of Plant and Equipment

  A. Building and land

    1. Sweat rooms, type, capacity, and condition

    2. Plant, type, capacity, and condition--receiving, packing, stack off, carton storage, box shed, office, shops and pre-cooler

    3. Land, location and size

    4. Market value of buildings--main packing house structure, sweat rooms, box shed, pre-cooler, office, and others

  B. Equipment

    1. Field equipment, number, type, and capacity

2. Market value of field equipment

3. Packing house equipment, type, number and capacity of receiving equipment, dump, wash line, grading tables, sizer, and packing tables

4. Market value of packing house equipment--receiving, dump, wash, grade, size, stamp, pack, set-off, and others

C. Wage rates by job classification--manager, assistant manager, office manager, assistant bookkeeper, field men, packing house superintendent, grade and pack foreman, receiving foreman, receivers, graders, packers, carton assembly, carton tally, carton set-off, loaders, carton unload and load fork trucker, mechanic, night watchman, and clean-up man.

APPENDIX B

EXPANSION PATH COST CALCULATION

AN ILLUSTRATION OF EXPANSION PATH COST CALCULATION

For ease of reference, data required for the calculation of expansion path cost are listed below:

1. Area alternative expansion plans indicating packing house volume and capacity are presented in Appendix C.
2. Assembly costs of existing base-year packing houses are presented in Table 26.
3. Assembly costs for new packing houses are presented in Table 24.
4. Variable packing costs of existing base-year packing houses are presented in Table 23.
5. Variable packing costs for new packing houses are presented in Table 22.
6. Total fixed packing costs of existing base-year packing houses are presented in Table 23.
7. Total fixed packing costs for new packing houses are presented in Table 22.
8. The increases in fixed packing costs associated with an expansion of plant capacity for existing base-year packing houses are presented in Table 29.

The expansion path of total assembly and packing cost for packing house 1A located in Area 1--Sanger and operating under Alternative Plan 2 was selected for this illustration. A summary of pertinent cost calculations for this packing house and alternative plan is contained in Table 37 and reference to this summary is made in the following paragraphs.

The volume handled (Column 1) by packing house 1A for each year of the planning period and capacity information (Column 2) was obtained

TABLE 37. TOTAL ASSEMBLY AND PACKING COST FOR PACKING HOUSE IA, AREA I, ALTERNATIVE 2, 1962-63 TO 1972-73

					Packing cost			
			Assembly cost		Variable cost			
Year	Volume handled (1)	Capacity (2)	Per unit (3)	Total (4)	Per unit (5)	Total (6)	Fixed cost total (7)	Total assembly and packing cost (8)
	field boxes		dols/f.b.	dollars	dols/f.b.	dollars	dollars	dollars
1962-63	446,042	C	.11831	52,771	.48610	216,821	81,415	351,007
1963-64	584,331	C	.12161	71,060	.49417	288,759	82,848	442,667
1964-65	722,630	C	.12491	90,264	.50224	362,934	84,281	537,479
1965-66	860,909	D	.10033	86,375	.44981	387,245	105,669	579,289
1966-67	970,872	D	.10197	99,000	.45692	443,611	107,529	650,140
1967-68	970,872	D	.10361	100,592	.46403	450,514	109,389	660,495
1968-69	970,872	D	.10525	102,184	.47114	457,417	111,249	670,850
1969-70	970,872	D	.10689	103,777	.47825	464,320	113,109	681,206
1970-71	970,872	D	.10853	105,369	.48536	471,222	114,969	691,560
1971-72	970,872	D	.11017	106,961	.49247	478,125	116,829	701,915
1972-73	970,872	D	.11181	108,553	.49958	485,028	118,689	712,270

from Appendix C, Table 39. Capacity information indicated that packing house IA would operate at its existing annual capacity of 728,154 field boxes through the 1964-65 season, and then expand facilities to handle a capacity of 970,872 field boxes annually.

The per unit assembly cost (Column 3) for the base year 1962-63 of $.11831 per field box was obtained from Table 26. This per unit assembly cost was then inflated an average of 2.79 per cent per year through the 1964-65 season at which time the packing house changed to a bulk-handling method of assembly. The per unit assembly cost for the bulk-handling method used from 1965-66 to 1972-73 was derived from the area base-year bulk-handling per unit assembly cost shown in Table 24 inflated an average of 1.72 per cent per year. Total assembly costs (Column 4) were obtained by multiplying the volume handled for the year indicated by the corresponding per unit assembly cost.

The variable packing costs (Column 5) were calculated by a similar method used in the calculation of assembly costs. Per unit variable cost for packing house IA for the base year 1962-63 or $.48610 per field box was obtained from Table 23. This base-year variable packing cost was then inflated an average of 1.66 per cent per year through the 1964-65 season. From 1965-66 to 1972-73 per unit variable packing costs were calculated from per unit packing costs of new "model" packing houses indicated in Table 22 inflated an average of 1.66 per cent per year. Total variable packing costs (Column 6) were obtained by multiplying the volume handled for the year indicated by the corresponding per unit variable packing cost.

Total fixed packing costs (Column 7) for packing house 1A for the base year 1962-63 of $81,415 were obtained from Table 23. This base-year total fixed packing cost was then inflated an average of 1.76 per cent per year through the 1964-65 season. Following expansion in that year, the total fixed packing cost for 1965-66 was calculated as the sum of the original inflated total fixed cost and the increase in total fixed cost associated with the expansion of packing house facilities from capacity rating C to D as shown in Table 29 inflated to 1965-66 an average of 2.05 per cent per year. The inflation factor of 2.05 per cent is indicated in Table 32 and represents the inflation factor for total fixed costs of packing houses constructed after the base year 1962-63. Total fixed costs, after the expansion year 1965-66, were inflated an average of 1.76.

The expansion path of total assembly and packing costs for packing house 1A under Alternative Plan 2 was obtained by summing the total assembly costs and total variable and fixed packing costs over the planning period. The expansion path of total costs for an area plan was the sum of the expansion paths of all packing houses in the plan.

APPENDIX C

AREA EXPANSION PLANS

TABLE 38. A PROJECTION OF THE NUMBER, SIZE, AND VOLUME HANDLED OF ORANGE PACKING HOUSES IN CENTRAL CALIFORNIA FOR AREA 1, ALTERNATIVE 1, 1962-63 TO 1972-73[a]

		Packing house 1A		Packing house 1B (new)	
Year	Area volume field boxes	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]
1962-63	446,042	446,042	C	---	
1963-64	584,331	584,331	C	---	
1964-65	722,630	722,630	C	---	
1965-66	860,909	728,154	C[c]	132,755	E[d]
1966-67	999,198	728,154	C	271,044	E
1967-68	1,137,487	728,154	C	409,333	E
1968-69	1,275,776	728,154	C	547,622	E
1969-70	1,414,065	728,154	C	685,911	E
1970-71	1,552,354	728,154	C	824,200	E
1971-72	1,690,643	728,154	C	962,489	E
1972-73	1,828,930	728,154	C	1,100,778	E

[a] One packing house operated in the area during 1962-63.

[b] For capacity code see Table 27.

[c] Packing house operated at capacity indicated.

[d] New packing house constructed with capacity indicated.

TABLE 39. A PROJECTION OF THE NUMBER, SIZE, AND VOLUME HANDLED OF ORANGE PACKING HOUSES IN CENTRAL CALIFORNIA FOR AREA 1, ALTERNATIVE 2, 1962-63 TO 1972-73[a]

Year	Area volume field boxes	Packing house 1A Volume field boxes	Capacity[b]	Packing house 1C (new) Volume field boxes	Capacity[b]
1962-63	446,042	446,042	C	---	
1963-64	584,331	584,331	C	---	
1964-65	722,630	722,630	C	---	
1965-66	860,909	860,909	D[c]	---	
1966-67	999,198	970,872	D[d]	28,326	D[e]
1967-68	1,137,487	970,972	D	166,615	D
1968-69	1,275,776	970,872	D	304,904	D
1969-70	1,414,065	970,872	D	443,193	D
1970-71	1,552,354	970,872	D	581,482	D
1971-72	1,690,643	970,872	D	719,771	D
1972-73	1,828,930	970,872	D	858,060	D

[a] One packing house operated in the area during 1962-63.

[b] For capacity code see Table 27.

[c] Packing house expanded to capacity indicated.

[d] Packing house operated at capacity indicated.

[e] New packing house constructed with capacity indicated.

TABLE 40. A PROJECTION OF THE NUMBER, SIZE, AND VOLUME HANDLED OF ORANGE PACKING HOUSES IN CENTRAL CALIFORNIA FOR AREA 1, ALTERNATIVE 3, 1962-63 TO 1972-73[a]

Year	Area volume field boxes	Packing house 1A		Packing house 1D (new)	
		Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]
1962-63	446,042	446,042	C	---	
1963-64	584,331	584,331	C	---	
1964-65	722,630	722,630	C	---	
1965-66	860,909	Closed		860,909	H[c]
1966-67	999,198	---		999,198	H
1967-68	1,137,487	---		1,137,487	H
1968-69	1,275,776	---		1,275,776	H
1969-70	1,414,065	---		1,414,065	H
1970-71	1,552,354	---		1,552,354	H
1971-72	1,690,643	---		1,690,643	H
1972-73	1,828,930	---		1,828,930	H

[a] One packing house operated in the area during 1962-63.

[b] For capacity code see Table 27.

[c] New packing house constructed with capacity indicated.

TABLE 41. A PROJECTION OF THE NUMBER, SIZE, AND VOLUME HANDLED OF ORANGE PACKING HOUSES IN CENTRAL CALIFORNIA FOR AREA 2, ALTERNATIVE 1, 1962-63 TO 1972-73[a]

		Packing house 2A		Packing house 2B		Packing house 2C		Packing house 2D	
Year	Area volume field boxes	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]
1962-63	1,715,292	286,270	C	493,569	D	207,299	B	728,154	C[c]
1963-64	2,048,501	382,901	C	660,173	D	277,273	B	728,154	C
1964-65	2,381,710	479,531	C	826,778	D	347,247	B	728,154	C
1965-66	2,714,919	589,217	C	970,872	D[c]	426,676	B	728,154	C
1966-67	3,048,128	728,154	C[c]	970,872	D	485,436	B[c]	728,154	C
1967-68	3,381,337	728,154	C	970,872	D	485,436	B	728,154	C
1968-69	3,714,546	728,154	C	970,872	D	485,436	B	728,154	C
1969-70	4,047,755	728,154	C	970,872	D	485,436	B	728,154	C
1970-71	4,380,964	728,154	C	970,872	D	485,436	B	728,154	C
1971-72	4,714,173	728,154	C	970,872	D	485,436	B	728,154	C
1972-73	5,047,386	728,154	C	970,872	D	485,436	B	728,154	C

TABLE 41.--Continued

	Packing house 2E (new)	
Year	Volume field boxes	Capacity[a]
1962-63	---	
1963-64	---	
1964-65	---	
1965-66	---	
1966-67	135,512	H[d]
1967-68	468,721	H
1968-69	801,930	H
1969-70	1,135,139	H
1970-71	1,468,348	H
1971-72	1,801,557	H
1972-73	2,134,766	H

[a] Four packing houses operated in the area during 1962-63.

[b] For capacity code see Table 27.

[c] Packing house operated at capacity indicated.

[d] New packing house constructed with capacity indicated.

TABLE 42. A PROJECTION OF THE NUMBER, SIZE, AND VOLUME HANDLED OF ORANGE PACKING HOUSES IN CENTRAL CALIFORNIA FOR AREA 2, ALTERNATIVE 2, 1962-63 TO 1972-73[a]

		Packing house 2A		Packing house 2B		Packing house 2C		Packing house 2D	
Year	Area volume field boxes	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]
1962-63	1,715,292	286,270	C	493,569	D	207,299	B	728,154	C[c]
1963-64	2,048,501	382,901	C	660,173	D	277,273	B	728,154	C
1964-65	2,381,710	479,531	C	826,778	D	347,247	B	728,154	C
1965-66	2,714,919	589,217	C	970,872	D[c]	426,676	B	728,154	C
1966-67	3,048,128	728,154	C[c]	1,106,384	H[d]	485,436	B[c]	728,154	C
1967-68	3,381,337	728,154	C	1,439,593	H	485,436	B	728,154	C
1968-69	3,714,546	728,154	C	1,772,802	H	485,436	B	728,154	C
1969-70	4,047,755	728,154	C	1,941,744	H[c]	485,436	B	892,421	H[d]
1970-71	4,380,964	728,154	C	1,941,744	H	485,436	B	1,225,630	H
1971-72	4,714,173	728,154	C	1,941,744	H	485,436	B	1,558,839	H
1972-73	5,047,386	728,154	C	1,941,744	H	485,436	B	1,892,052	H

[a] Four packing houses operated in the area during 1962-63.

[b] For capacity code see Table 27.

[c] Packing house operated at capacity indicated.

[d] Packing house expanded to capacity indicated.

TABLE 43. A PROJECTION OF THE NUMBER, SIZE, AND VOLUME HANDLED OF ORANGE PACKING HOUSES IN CENTRAL CALIFORNIA FOR AREA 2, ALTERNATIVE 3, 1962-63 TO 1972-73[a]

Year	Area volume field boxes	Packing house 2A		Packing house 2B		Packing house 2C		Packing house 2D	
		Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]
1962-63	1,715,292	286,270	C	493,569	D	207,299	B	728,154	C[c]
1963-64	2,048,501	382,901	C	660,173	D	277,273	B	728,154	C
1964-65	2,381,710	479,531	C	826,778	D	347,247	B	728,154	C
1965-66	2,714,919	589,217	C	970,872	D[c]	426,676	B	728,154	C
1966-67	3,048,128	Closed		1,645,423	H[d]	Closed		1,402,705	H[d]
1967-68	3,381,337	---		1,812,028	H	---		1,569,309	H
1968-69	3,714,546	---		1,941,744	H[c]	---		1,772,802	H
1969-70	4,047,755	---		1,941,744	H	---		1,941,744	H
1970-71	4,380,964	---		1,941,744	H	---		1,941,744	H
1971-72	4,714,173	---		1,941,744	H	---		1,941,744	H
1972-73	5,047,386	---		1,941,744	H	---		1,941,744	H

TABLE 43.--Continued

	Packing house 2F (new)	
Year	Volume field boxes	Capacity[b]
1962-63	---	
1963-64	---	
1964-65	---	
1965-66	---	
1966-67	---	
1967-68	---	
1968-69	---	
1969-70	164,267	G[e]
1970-71	497,476	G
1971-72	830,685	G
1972-73	1,163,898	G

[a] Four packing houses operated in the area during 1962-63.

[b] For capacity code see Table 27.

[c] Packing house operated at capacity indicated.

[d] Packing house expanded to capacity indicated.

[e] New packing house constructed with capacity indicated.

TABLE 44. A PROJECTION OF THE NUMBER, SIZE, AND VOLUME HANDLED OF ORANGE PACKING HOUSES IN CENTRAL CALIFORNIA FOR AREA 3, ALTERNATIVE 1, 1962-63 TO 1972-73[a]

Year	Area volume field boxes	Packing house 3A Volume field boxes	Packing house 3A Capacity[b]	Packing house 3B (new) Volume field boxes	Packing house 3B (new) Capacity[b]
1962-63	126,009	126,009	B	---	
1963-64	332,734	332,734	B	---	
1964-65	539,459	485,436	B[c]	54,023	H[d]
1965-66	746,184	485,436	B	260,748	H
1966-67	952,909	485,436	B	467,473	H
1967-68	1,159,634	485,436	B	674,198	H
1968-69	1,366,359	485,436	B	880,923	H
1969-70	1,573,084	485,436	B	1,087,648	H
1970-71	1,779,809	485,436	B	1,294,373	H
1971-72	1,986,534	485,436	B	1,501,098	H
1972-73	2,193,263	485,436	B	1,707,827	H

[a] One packing house operated in the area during 1962-63.

[b] For capacity code see Table 27.

[c] Packing house operated at capacity indicated.

[d] New packing house constructed with capacity indicated.

TABLE 45. A PROJECTION OF THE NUMBER, SIZE, AND VOLUME HANDLED OF ORANGE PACKING HOUSES IN CENTRAL CALIFORNIA FOR AREA 3, ALTERNATIVE 2, 1962-63 TO 1972-73[a]

Year	Area volume field boxes	Packing house 3A		Packing house 3C (new)	
		Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]
1962-63	126,009	126,009	B	---	
1963-64	332,734	332,734	B	---	
1964-65	539,459	539,459	D[c]	---	
1965-66	746,184	746,184	D	---	
1966-67	952,909	952,909	D		
1967-68	1,159,634	970,872	D[d]	188,762	D[e]
1968-69	1,366,359	970,872	D	395,487	D
1969-70	1,573,084	970,872	D	602,212	D
1970-71	1,779,809	970,872	D	808,937	D
1971-72	1,986,534	970,872	D	1,015,662	D
1972-73	2,193,263	970,872	D	1,222,387	D

[a] One packing house operated in the area during 1962-63.

[b] For capacity code see Table 27.

[c] Packing house expanded to capacity indicated.

[d] Packing house operated at capacity indicated.

[e] New packing house constructed with capacity indicated.

TABLE 46. A PROJECTION OF THE NUMBER, SIZE, AND VOLUME HANDLED OF ORANGE PACKING HOUSES IN CENTRAL CALIFORNIA FOR AREA 3, ALTERNATIVE 3, 1962-63 TO 1972-73[a]

		Packing house 3A		Packing house 3D (new)	
Year	Area volume field boxes	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]
1962-63	126,009	126,009	B	---	
1963-64	332,734	332,734	B	---	
1964-65	539,459	Closed		539,459	H[c]
1965-66	746,184	---		746,184	H
1966-67	952,909	---		952,909	H
1967-68	1,159,634	---		1,159,634	H
1968-69	1,366,359	---		1,366,359	H
1969-70	1,573,084	---		1,573,084	H
1970-71	1,779,809	---		1,779,809	H
1971-72	1,986,534	---		1,986,534	H[d]
1972-73	2,193,263	---		2,193,263	H

[a] One packing house operated in the area during 1962-63.

[b] For capacity code see Table 27.

[c] New packing house constructed with capacity indicated.

[d] Packing house operated at capacity indicated.

TABLE 47. A PROJECTION OF THE NUMBER, SIZE, AND VOLUME HANDLED OF ORANGE PACKING HOUSES IN CENTRAL CALIFORNIA FOR AREA 4, ALTERNATIVE 1, 1962-63 TO 1972-73[a]

Year	Area volume field boxes	Packing house 4A		Packing house 4B		Packing house 4C		Packing house 4D	
		Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]
1962-63	413,413	99,219	B	132,292	B	111,621	A	70,281	A
1963-64	590,953	141,828	B	189,104	B	159,557	A	100,464	A
1964-65	768,493	184,438	B	245,917	B	207,493	A	130,645	A
1965-66	946,033	232,094	B	309,456	B	242,718	A[c]	161,763	A
1966-67	1.123,573	290,682	B	387,576	B	242,718	A	202,597	A
1967-68	1,301,113	349,626	B	466,051	B	242,718	A	242,718	A[c]
1968-69	1,478,653	485,436	B[c]	485,436	B[c]	242,718	A	242,718	A
1969-70	1,656,193	485,436	B	485,436	B	242,718	A	242,718	A
1970-71	1,833,733	485,436	B	485,436	B	242,718	A	242,718	A
1971-72	2,011,273	485,436	B	485,436	B	242,718	A	242,718	A
1972-73	2,188,809	485,436	B	485,436	B	242,718	A	242,718	A

TABLE 47.--Continued

	Packing house 4E (new)	
Year	Volume field boxes	Capacity[b]
1962-63	---	
1963-64	---	
1964-65	---	
1965-66	---	
1966-67	---	
1967-68	---	
1968-69	22,345	C[d]
1969-70	199,885	C
1970-71	377,425	C
1971-72	554,965	C
1972-73	732,505	C

[a] Four packing houses operated in the area during 1962-63.

[b] For capacity code see Table 27.

[c] Packing house operated at capacity indicated.

[d] New packing house constructed with capacity indicated.

TABLE 48. A PROJECTION OF THE NUMBER, SIZE, AND VOLUME HANDLED OF ORANGE PACKING HOUSES IN CENTRAL CALIFORNIA FOR AREA 4, ALTERNATIVE 2, 1962-63 TO 1972-73[a]

Year	Area volume field boxes	Packing house 4A		Packing house 4B		Packing house 4C		Packing house 4D	
		Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]
1962-63	413,413	99,219	B	132,292	B	111,621	A	70,281	A
1963-64	590,953	141,828	B	189,104	B	159,557	A	100,464	A
1964-65	768,493	184,438	B	245,917	B	207,493	A	130,645	A
1965-66	946,033	Closed		519,125	D[c]	Closed		426,908	D[c]
1966-67	1,123,573	---		607,895	D	---		515,678	D
1967-68	1,301,113	---		696,665	D	---		604,448	D
1968-69	1,478,653	---		785,435	D	---		693,218	D
1969-70	1,656,193	---		874,205	D	---		781,988	D
1970-71	1,833,733	---		962,975	D	---		870,758	D
1971-72	2,011,273	---		1,051,745	D	---		959,528	D
1972-73	2,188,809	---		1,140,515	D	---		1,048,298	D

[a] Four packing houses operated in the area during 1962-63.

[b] For capacity code see Table 27.

[c] Packing house expanded to capacity indicated.

TABLE 49. A PROJECTION OF THE NUMBER, SIZE, AND VOLUME HANDLED OF ORANGE PACKING HOUSES IN CENTRAL CALIFORNIA FOR AREA 4, ALTERNATIVE 3, 1962-63 TO 1972-73[a]

		Packing house 4A		Packing house 4B		Packing house 4C		Packing house 4D	
Year	Area volume field boxes	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]
1962-63	413,413	99,219	B	132,292	B	111,621	A	70,281	A
1963-64	590,953	141,828	B	189,104	B	159,557	A	100,464	A
1964-65	768,493	184,438	B	245,917	B	207,493	A	130,645	A
1965-66	946,033	Closed		Closed		Closed		Closed	
1966-67	1,123,573	---		---		---		---	
1967-68	1,301,113	---		---		---		---	
1968-69	1,478,653	---		---		---		---	
1969-70	1,656,193	---		---		---		---	
1970-71	1,833,733	---		---		---		---	
1971-72	2,011,273	---		---		---		---	
1972-73	2,188,809	---		---		---		---	

TABLE 49.--Continued

Years	Packing house 4F (new)	
	Volume field boxes	Capacity[b]
1962-63	---	
1963-64	---	
1964-65	---	
1965-66	946,033	H[c]
1966-67	1,123,573	H
1967-68	1,301,113	H
1968-69	1,478,653	H
1969-70	1,656,193	H
1970-71	1,833,733	H
1971-72	2,011,273	H
1972-73	2,188,809	H

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[a] Four packing houses operated in the area during 1962-63.

[b] For capacity code see Table 27.

[c] New packing house constructed with capacity indicated.

TABLE 50. A PROJECTION OF THE NUMBER, SIZE, AND VOLUME HANDLED OF ORANGE PACKING HOUSES IN CENTRAL CALIFORNIA FOR AREA 5, ALTERNATIVE 1, 1962-63 TO 1972-73[a]

Year	Area volume field boxes	Packing house 5A		Packing house 5B		Packing house 5C		Packing house 5D	
		Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]
1962-63	1,954,838	293,226	B	97,742	A	547,354	D	625,548	C
1963-64	2,171,386	325,707	B	108,569	A	607,988	D	694,843	C
1964-65	2,387,934	365,152	B	116,185	A	680,509	D	728,154	C[c]
1965-66	2,604,482	412,792	B	131,343	A	769,294	D	728,154	C
1966-67	2,821,030	485,436	B[c]	144,669	A	851,943	D	728,154	C
1967-68	3,037,578	485,436	B	164,159	A	966,714	D	728,154	C
1968-69	3,254,126	584,228	D[d]	242,718	A[c]	970,872	D[c]	728,154	C
1969-70	3,470,674	692,502	D	350,992	C[d]	970,872	D	728,154	C
1970-71	3,687,222	800,776	D	459,266	C	970,872	D	728,154	C
1971-72	3,903,770	909,050	D	567,540	C	970,872	D	728,154	C
1972-73	4,120,322	1,017,324	D	675,814	C	970,872	D	728,154	C

TABLE 50.--Continued

Year	Packing house 5E Volume field boxes	Capacity[b]
1962-63	390,968	C
1963-64	434,279	C
1964-65	497,934	C
1965-66	562,899	C
1966-67	610,828	C
1967-68	693,115	C
1968-69	728,154	C[c]
1969-70	728,154	C
1970-71	728,154	C
1971-72	728,154	C
1972-73	728,154	C

[a] Five packing houses operated in the area during 1962-63

[b] For capacity code see Table 27.

[c] Packing house operated at capacity indicated.

[d] Packing house expanded to capacity indicated.

TABLE 51. A PROJECTION OF THE NUMBER, SIZE, AND VOLUME HANDLED OF ORANGE PACKING HOUSES IN CENTRAL CALIFORNIA FOR AREA 5, ALTERNATIVE 2, 1962-63 TO 1972-73[a]

Year	Area volume field boxes	Packing house 5A		Packing house 5C		Packing house 5D	
		Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]
1962-63	1,954,838	429,339	B	797,345	D	728,154	C[c]
1963-64	2,171,386	485,436	B[c]	957,796	D	728,154	C
1964-65	2,387,934	485,436	B	1,057,408	H[d]	845,090	H[d]
1965-66	2,604,482	485,436	B	1,157,020	H	962,026	H
1966-67	2,821,030	485,436	B	1,256,632	H	1,078,962	H
1967-68	3,037,578	485,436	B	1,356,244	H	1,195,898	H
1968-69	3,254,126	485,436	B	1,455,856	H	1,312,834	H
1969-70	3,470,674	485,436	B	1,555,468	H	1,429,770	H
1970-71	3,687,222	485,436	B	1,655,080	H	1,546,706	H
1971-72	3,903,770	485,436	B	1,754,692	H	1,663,642	H
1972-73	4,120,322	485,436	B	1,854,308	H	1,780,578	H

[a] Three packing houses operated in the area during 1962-63. Packing houses 5B and 5E were closed.

[b] For capacity code see Table 27.

[c] Packing house operated at capacity indicated.

[d] Packing house expanded to capacity indicated.

TABLE 52. A PROJECTION OF THE NUMBER, SIZE, AND VOLUME HANDLED OF ORANGE PACKING HOUSES IN CENTRAL CALIFORNIA FOR AREA 5, ALTERNATIVE 3, 1962-63 TO 1972-73[a]

		Packing house 5A		Packing house 5C		Packing house 5D		Packing house 5F (new)	
Year	Area volume field boxes	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]
1962-63	1,954,838	429,339	B	797,345	D	728,154	C[c]	---	
1963-64	2,171,386	485,436	B[c]	957,796	D	728,154	C	---	
1964-65	2,387,934	Closed		Closed		Closed		1,193,967	H[d]
1965-66	2,604,482	---		---		---		1,302,241	H
1966-67	2,821,030	---		---		---		1,410,515	H
1967-68	3,037,578	---		---		---		1,518,789	H
1968-69	3,254,126	---		---		---		1,627,063	H
1969-70	3,470,674	---		---		---		1,735,337	H
1970-71	3,687,222	---		---		---		1,843,611	H
1971-72	3,903,770	---		---		---		1,951,885	H[c]
1972-73	4,120,322	---		---		---		2,060,161	H

TABLE 52.--Continued

	Packing house 5G (new)	
Year	Volume field boxes	Capacity[c]
1962-63	---	
1963-64	---	
1964-65	1,193,967	H
1965-66	1,302,241	H
1966-67	1,410,515	H
1967-68	1,518,789	H
1968-69	1,627,063	H
1969-70	1,735,337	H
1970-71	1,843,611	H
1971-72	1,951,885	H[c]
1972-73	2,060,161	

[a] Three packing houses operated in the area during 1962-63. Packing houses 5B and 5E were closed.

[b] For capacity code see Table 27.

[c] Packing house operated at capacity indicated.

[d] New packing house constructed with capacity indicated.

TABLE 53. A PROJECTION OF THE NUMBER, SIZE, AND VOLUME HANDLED OF ORANGE PACKING HOUSES IN CENTRAL CALIFORNIA FOR AREA 6, ALTERNATIVE 1, 1962-63 TO 1972-73[a]

Year	Area volume field boxes	Packing house 6A		Packing house 6B		Packing house 6C	
		Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]
1962-63	321,299	173,501	A	73,899	A	73,899	A
1963-64	466,877	242,718	A[c]	112,079	A	112,080	A
1964-65	612,455	242,718	A	184,868	A	184,869	A
1965-66	758,033	272,597	D[d]	242,718	A[c]	242,718	A
1966-67	903,611	418,175	D	242,718	A	242,718	A
1967-68	1,049,189	563,753	D	242,718	A	242,718	A
1968-69	1,194,767	709,331	D	242,718	A	242,718	A
1969-70	1,340,345	854,909	D	242,718	A	242,718	A
1970-71	1,485,923	970,872	D[c]	272,333	C	242,718	A
1971-72	1,631,501	970,872	D	417,911	C	242,718	A
1972-73	1,777,080	970,972	D	563,490	C	242,718	A

[a] Three packing houses operated in the area during 1962-63.

[b] For capacity code see Table 27.

[c] Packing house operated at capacity indicated.

[d] Packing house expanded to capacity indicated.

TABLE 54. A PROJECTION OF THE NUMBER, SIZE, AND VOLUME HANDLED OF ORANGE PACKING HOUSES IN CENTRAL CALIFORNIA FOR AREA 6, ALTERNATIVE 2, 1962-63 TO 1972-73[a]

Year	Area volume field boxes	Packing house 6A Volume field boxes	Capacity[b]	Packing house 6B Volume field boxes	Capacity[b]
1962-63	321,299	173,501	A	147,798	A
1963-64	466,877	242,718	A[c]	224,159	A
1964-65	612,455	242,718	A	369,737	D[d]
1965-66	758,033	242,597	D[d]	485,436	D
1966-67	903,611	418,175	D	485,436	D
1967-68	1,049,189	563,753	D	485,436	D
1968-69	1,194,767	709,331	D	485,436	D
1969-70	1,340,345	854,909	D	485,436	D
1970-71	1,485,923	970,872	D[c]	515,051	D
1971-72	1,631,501	970,872	D	660,629	D
1972-73	1,777,080	970,872	D	806,208	D

[a] Three packing houses operated in the area during 1962-63. Packing house 6C was closed.

[b] For capacity code see Table 27.

[c] Packing house operated at capacity indicated.

[d] Packing house expanded to capacity indicated.

TABLE 55. A PROJECTION OF THE NUMBER, SIZE, AND VOLUME HANDLED OF ORANGE PACKING HOUSES IN CENTRAL CALIFORNIA FOR AREA 6, ALTERNATIVE 3, 1962-63 TO 1972-73[a]

Year	Area volume field boxes	Packing house 6A		Packing house 6B		Packing house 6C		Packing house 6D (new)	
		Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]
1962-63	321,299	173,501	A	73,899	A	73,899	A	---	
1963-64	466,877	242,718	A[c]	112,079	A	112,080	A	---	
1964-65	612,455	242,718	A	184,868	A	184,869	A	---	
1965-66	758,033	Closed		Closed		Closed		758,033	G[d]
1966-67	903,611	---		---		---		903,611	G
1967-68	1,049,189	---		---		---		1,049,189	G
1968-69	1,194,767	---		---		---		1,194,767	G
1969-70	1,340,345	---		---		---		1,340,345	G
1970-71	1,485,923	---		---		---		1,485,923	G
1971-72	1,631,501	---		---		---		1,631,501	G
1972-73	1,777,080	---		---		---		1,777,080	G

[a] Three packing houses operated in the area during 1962-63.

[b] For capacity code see Table 27.

[c] Packing house operated at capacity indicated.

[d] New packing house constructed with capacity indicated.

TABLE 56. A PROJECTION OF THE NUMBER, SIZE, AND VOLUME HANDLED OF ORANGE PACKING HOUSES IN CENTRAL CALIFORNIA FOR AREA 7, ALTERNATIVE 1, 1962-63 TO 1972-73[a]

Year	Area volume field boxes	Packing house 7A		Packing house 7B		Packing house 7C	
		Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]
1962-63	1,664,288	93,613	B	728,154	C[c]	842,521	D
1963-64	1,713,267	98,511	B	728,154	C	886,602	D
1964-65	1,762,246	103,409	B	728,154	C	930,683	D
1965-66	1,811,225	112,199	B	728,154	C	970,872	D[c]
1966-67	1,860,204	161,178	B	728,154	C	970,872	D
1967-68	1,909,183	210,157	B	728,154	C	970,872	D
1968-69	1,958,162	259,136	B	728,154	C	970,872	D
1969-70	2,007,141	308,115	B	728,154	C	970,872	D
1970-71	2,056,120	357,094	B	728,154	C	970,872	D
1971-72	2,105,099	406,073	B	728,154	C	970,872	D
1972-73	2,154,082	455,056	B	728,154	C	970,872	D

[a] Three packing houses operated in the area during 1962-63.

[b] For capacity code see Table 27.

[c] Packing house operated at capacity indicated.

TABLE 57. A PROJECTION OF THE NUMBER, SIZE, AND VOLUME HANDLED OF ORANGE PACKING HOUSES IN CENTRAL CALIFORNIA FOR AREA 7, ALTERNATIVE 2, 1962-63 TO 1972-73[a]

		Packing house 7B		Packing house 7C	
Year	Area volume field boxes	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]
1962-63	1,664,288	728,154	C[c]	936,134	D
1963-64	1,713,267	742,395	D[d]	970,872	D
1964-65	1,762,246	791,374	D	970,872	D
1965-66	1,811,225	840,353	D	970,872	D
1966-67	1,860,204	889,332	D	970,872	D
1967-68	1,909,183	938,311	D	970,872	D
1968-69	1,958,162	987,290	D[c]	970,872	D
1969-70	2,007,141	1,036,269	D	970,872	D
1970-71	2,056,120	1,085,248	D	970,872	D
1971-72	2,105,099	1,134,227	D	970,872	D
1972-73	2,154,082	1,183,206	D	970,872	D

[a] Two packing houses operated in the area during 1962-63. Packing house 7A was closed.

[b] For capacity code see Table 27.

[c] Packing house operated at capacity indicated.

[d] Packing house expanded to capacity indicated.

TABLE 58. A PROJECTION OF THE NUMBER, SIZE, AND VOLUME HANDLED OF ORANGE PACKING HOUSES IN CENTRAL CALIFORNIA FOR AREA 7, ALTERNATIVE 3, 1962-63 TO 1972-73[a]

		Packing house 7C	
Year	Area volume field boxes	Volume field boxes	Capacity[b]
1962-63	1,664,288	1,664,288	D to H
1963-64	1,713,267	1,713,267	H
1964-65	1,762,246	1,762,246	H
1965-66	1,811,225	1,811,225	H
1966-67	1,860,204	1,860,204	H
1967-68	1,909,183	1,909,183	H
1968-69	1,958,162	1,958,162	H
1969-70	2,007,141	2,007,141	H
1970-71	2,056,120	2,056,120	H
1971-72	2,105,099	2,105,099	H
1972-73	2,154,082	2,154,082	H

[a] One packing house operated in the area during 1962-63. Packing houses 7A and 7B were closed.

[b] For capacity code see Table 27.

TABLE 59. A PROJECTION OF THE NUMBER, SIZE, AND VOLUME HANDLED OF ORANGE PACKING HOUSES IN CENTRAL CALIFORNIA FOR AREA 8, ALTERNATIVE 1, 1962-63 TO 1972-73[a]

		Packing house 8A		Packing house 8B		Packing house 8C		Packing house 8D	
Year	Area volume field boxes	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]
1962-63	4,746,629	332,264	C	379,730	C	332,264	D	94,933	A
1963-64	4,595,375	321,676	C	367,630	C	321,676	D	91,908	A
1964-65	4,444,119	311,088	C	355,530	C	311,088	D	88,883	A
1965-66	4,292,863	300,500	C	343,430	C	300,500	D	85,858	A
1966-67	4,141,607	289,912	C	331,330	C	289,912	D	82,833	A
1967-68	3,990,351	279,324	C	319,230	C	279,324	D	79,808	A
1968-69	3,839,095	266,719	C	306,625	C	266,719	D	67,203	A
1969-70	3,687,839	254,114	C	294,020	C	254,114	D	54,598	A
1970-71	3,536,583	241,509	C	281,415	C	241,509	D	41,993	A
1971-72	3,385,327	228,904	C	268,810	C	228,904	E	29,388	A
1972-73	3,234,071	216,299	C	256,205	C	216,299	D	16,783	A

TABLE 59.--Continued

Year	Packing house 8E		Packing house 8F		Packing house 8G		Packing house 8H	
	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]
1962-63	94,933	A	569,595	D	474,662	C	189,865	C
1963-64	91,908	A	551,444	D	459,536	C	183,815	C
1964-65	88,883	A	533,293	D	444,410	C	177,765	C
1965-66	85,858	A	515,142	D	429,284	C	171,715	C
1966-67	82,833	A	496,991	D	414,158	C	165,665	C
1967-68	79,808	A	478,840	D	399,032	C	159,615	C
1968-69	67,203	A	466,235	D	386,427	C	147,010	C
1969-70	54,598	A	453,630	D	373,822	C	134,405	C
1970-71	41,993	A	441,025	D	361,217	C	121,800	C
1971-72	29,388	A	428,420	D	348,612	C	109,195	C
1972-73	16,783	A	415,815	D	336,007	C	96,590	C

TABLE 59.--Continued

Year	Packing house 8I		Packing house 8J		Packing house 8K		Packing house 8L	
	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]
1962-63	854,393	D	237,331	C	237,331	B	949,328	D
1963-64	827,167	D	229,768	C	229,768	B	919,077	D
1964-65	799,941	D	222,205	C	222,205	B	888,826	D
1965-66	772,715	D	214,642	C	214,642	B	858,575	D
1966-67	745,489	D	207,079	C	207,079	B	828,324	D
1967-68	718,263	D	199,516	C	199,516	B	798,073	D
1968-69	705,658	D	186,911	C	186,911	B	785,468	D
1969-70	693,053	D	174,306	C	174,306	B	772,873	D
1970-71	680,448	D	161,701	C	161,701	B	760,272	D
1971-72	667,843	D	149,096	C	149,096	B	747,671	D
1972-73	655,238	D	136,491	C	136,491	B	735,070	D

[a] Twelve packing houses operated in the area during 1962-63.

[b] For capacity code see Table 27.

TABLE 60. A PROJECTION OF THE NUMBER, SIZE, AND VOLUME HANDLED OF ORANGE PACKING HOUSES IN CENTRAL CALIFORNIA FOR AREA 8, ALTERNATIVE 2, 1962-63 TO 1972-73[a]

Year	Area volume field boxes	Packing house 8B		Packing house 8C		Packing house 8F		Packing house 8G	
		Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]
1962-63	4,746,629	728,154	C[c]	822,580	D	822,580	D	728,154	C[c]
1963-64	4,595,375	728,154	C	784,766	D	784,766	D	728,154	C
1964-65	4,444,119	728,154	C	746,952	D	746,952	D	728,154	C
1965-66	4,292,863	715,477	C	715,477	D	715,477	D	715,477	C
1966-67	4,141,607	690,268	C	690,268	D	690,268	D	690,268	C
1967-68	3,990 351	665,058	C	665,058	D	665,058	D	665,058	C
1968-69	3,839,095	639,849	C	639,849	D	639,849	D	639,849	C
1969-70	3,687,839	614,640	C	614,640	D	614,640	D	614,640	C
1970-71	3,536,583	589,430	C	589,430	D	589,430	D	589,430	C
1971-72	3,385,327	564,221	C	564,221	D	564,221	D	564,221	C
1972-73	3,234,071	539,012	C	539,012	D	539,012	D	539,012	C

TABLE 60.--Continued

Year	Packing house 8I		Packing house 8L	
	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]
1962-63	822,580	D	822,580	D
1963-64	784,766	D	784,766	D
1964-65	746,952	D	746,952	D
1965-66	715,477	D	715,477	D
1966-67	690,268	D	690,268	D
1967-68	665,058	D	665,058	D
1968-69	639,849	D	639,849	D
1969-70	614,640	D	614,640	D
1970-71	589,430	D	589,430	D
1971-72	564,221	D	564,221	D
1972-73	539,012	D	539,012	D

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[a] Six packing houses operated in the area during 1962-63. Packing houses 8A, 8D, 8E, 8H, 8J, and 8K were closed.

[b] For capacity code see Table 27.

[c] Packing house operated at capacity indicated.

TABLE 61. A PROJECTION OF THE NUMBER, SIZE, AND VOLUME HANDLED OF ORANGE PACKING HOUSES IN CENTRAL CALIFORNIA FOR AREA 8, ALTERNATIVE 3, 1962-63 TO 1972-73[a]

		Packing house 8B		Packing house 8C		Packing house 8F		Packing house 8G	
Year	Area volume field boxes	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]
1962-63	4,746,629	728,154	C[c]	822,580	D	822,580	D	728,154	C[c]
1963-64	4,595,375	728,154	C	784,766	D	784,766	D	728,154	C
1964-65	4,444,119	728,154	C	746,952	D	746,952	D	728,154	C
1965-66	4,292,863	715,477	C	715,477	D	715,477	D	715,477	C
1966-67	4,141,607	690,268	C	690,268	D	690,268	D	690,268	C
1967-68	3,990,351	665,058	C	665,058	D	665,058	D	665,058	C
1968-69	3,839,095	Closed		Closed		1,919,547	G[d]	Closed	
1969-70	3,687,839	---		---		1,843,919	G	---	
1970-71	3,536,583	---		---		1,768,291	G	---	
1971-72	3,385,327	---		---		1,692,663	G	---	
1972-73	3,234,071	---		---		1,617,036	G	---	

TABLE 61.--Continued

Year	Packing house 8I Volume field boxes	Capacity[b]	Packing house 8L Volume field boxes	Capacity[b]
1962-63	822,580	D	822,580	D
1963-64	784,766	D	784,766	D
1964-65	746,952	D	746,952	D
1965-66	715,477	D	715,477	D
1966-67	690,268	D	690,268	D
1967-68	665,058	D	665,058	D
1968-69	Closed		1,919,547	D
1969-70	---		1,843,919	D
1970-71	---		1,768,291	D
1971-72	---		1,692,663	D
1972-73	---		1,617,036	D

[a] Six packing houses operated in the area during 1962-63. Packing houses 8A, 8D, 8E, 8H, 8J, and 8K were closed.

[b] For capacity code see Table 27.

[c] Packing house operated at capacity indicated.

[d] Packing house expanded to capacity indicated.

TABLE 62. A PROJECTION OF THE NUMBER, SIZE, AND VOLUME HANDLED OF ORANGE PACKING HOUSES IN CENTRAL CALIFORNIA FOR AREA 9, ALTERNATIVE I, 1962-63 TO 1972-73[a]

		Packing house 9A		Packing house 9B		Packing house 9C		Packing house 9D	
Year	Area volume field boxes	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]
1962-63	1,623,091	357,080	C	194,770	C	211,002	C	616,775	D
1963-64	1,856,073	408,336	C	222,729	C	241,289	C	705,307	D
1964-65	2,089,055	459,592	C	250,687	C	271,577	C	793,841	D
1965-66	2,322,037	510,848	C	278,644	C	301,865	C	882,374	D
1966-67	2,555,019	562,104	C	306,602	C	332,152	C	970,872	D[c]
1967-68	2,788,001	620,350	C	364,848	C	390,398	C	970,872	D
1968-69	3,020,983	678,596	C	423,094	C	448,640	C	970,872	D
1969-70	3,253,965	728,154	C[c]	500,755	C	526,301	C	970,872	D
1970-71	3,486,947	728,154	C	578,416	C	603,962	C	970,872	D
1971-72	3,719,929	728,154	C	656,077	C	681,623	C	970,872	D
1972-73	3,952,906	728,154	C	733,738	C[c]	759,284	C[c]	970,872	D

TABLE 62.--Continued

Year	Packing house 9E Volume field boxes	Capacity[b]
1962-63	243,464	C
1963-64	278,412	C
1964-65	313,358	C
1965-66	348,306	C
1966-67	383,289	C
1967-68	441,533	C
1968-69	499,781	C
1969-70	577,442	C
1970-71	655,103	C
1971-72	732,764	C[c]
1972-73	810,425	C

[a] Five packing houses operated in the area during 1962-63.

[b] For capacity code see Table 27.

[c] Packing house operated at capacity indicated.

TABLE 63. A PROJECTION OF THE NUMBER, SIZE, AND VOLUME HANDLED OF ORANGE PACKING HOUSES IN CENTRAL CALIFORNIA FOR AREA 9, ALTERNATIVE 2, 1962-63 TO 1972-73[a]

		Packing house 9A		Packing house 9C		Packing house 9D	
Year	Area volume field boxes	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]
1962-63	1,623,091	486,927	C	292,156	C	844,008	D
1963-64	1,856,073	556,822	C	334,093	C	965,159	D
1964-65	2,089,055	626,717	C	376,030	C	1,086,310	H[c]
1965-66	2,322,037	696,612	C	417,967	C	1,207,461	H
1966-67	2,555,019	766,507	D[c]	459,904	C	1,328,612	H
1967-68	2,788,001	836,402	D	501,841	C	1,449,763	H
1968-69	3,020,983	914,063	D	579,596	C	1,527,424	H
1969-70	3,253,965	970,872	D[d]	678,008	C	1,605,085	H
1970-71	3,486,947	970,872	D	833,329	D[c]	1,682,746	H
1971-72	3,719,929	970,872	D	988,650	D	1,760,407	H
1972-73	3,952,906	970,872	D	1,143,966	D	1,838,068	H

[a] Three packing houses operated in the area for 1962-63. Packing houses 9B and 9E were closed.

[b] For capacity code see Table 27.

[c] Packing house expanded to capacity indicated.

[d] Packing house operated at capacity indicated.

TABLE 64. A PROJECTION OF THE NUMBER, SIZE, AND VOLUME HANDLED OF ORANGE PACKING HOUSES IN CENTRAL CALIFORNIA FOR AREA 9, ALTERNATIVE 3, 1962-63 TO 1972-73[a]

		Packing house 9D		Packing house 9F (new)	
Year	Area volume field boxes	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]
1962-63	1,623,091	844,008	D	779,083	H[c]
1963-64	1,856,073	965,159	D	890,914	H
1964-65	2,089,055	1,086,310	H[d]	1,002,745	H
1965-66	2,322,037	1,207,461	H	1,114,576	H
1966-67	2,555,019	1,328,612	H	1,226,407	H
1967-68	2,788,001	1,449,763	H	1,338,238	H
1968-69	3,020,783	1,527,424	H	1,493,559	H
1969-70	3,253,965	1,605,085	H	1,648,880	H
1970-71	3,486,947	1,682,746	H	1,804,201	H
1971-72	3,719,929	1,760,407	H	1,959,522	H[e]
1972-73	3,952,906	1,838,068	H	2,114,838	H

[a] Two packing houses operated in the area for 1962-63. Packing houses 9A, 9B, 9C, and 9E were closed.

[b] For capacity code see Table 27.

[c] New packing house constructed with capacity indicated.

[d] Packing house expanded to capacity indicated.

[e] Packing house operated at capacity indicated.

TABLE 65. A PROJECTION OF THE NUMBER, SIZE, AND VOLUME HANDLED OF ORANGE PACKING HOUSES IN CENTRAL CALIFORNIA FOR AREA 10, ALTERNATIVE 1, 1962-63 TO 1972-73[a]

		Packing house 10A		Packing house 10B		Packing house 10C		Packing house 10D	
Year	Area volume field boxes	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]
1962-63	1,882,380	282,357	B	376,476	C	282,357	C	225,886	B
1963-64	1,919,406	286,411	B	381,881	C	286,411	C	229,129	B
1964-65	1,936,432	290,465	B	387,286	C	290,465	C	232,372	B
1965-66	1,963,458	294,519	B	392,691	C	294,519	C	235,615	B
1966-67	1,990,484	298,573	B	398,096	C	298,573	C	238,858	B
1967-68	2,017,510	302,627	B	403,501	C	302,627	C	242,101	B
1968-69	2,044,536	306,488	B	407,362	C	306,488	C	245,962	B
1969-70	2,071,562	310,349	B	411,223	C	310,349	C	249,823	B
1970-71	2,098,588	314,210	B	415,084	C	314,210	C	253,684	B
1971-72	2,125,614	318,071	B	418,945	C	318,071	C	257,545	B
1972-73	2,152,643	321,932	B	422,806	C	321,932	C	261,406	B

TABLE 65.--Continued

Year	Packing house 10E		Packing house 10F		Packing house 10G	
	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]
1962-63	225,886	C	320,004	C	169,414	B
1963-64	229,129	C	324,598	C	171,847	B
1964-65	232,372	C	329,192	C	174,280	B
1965-66	235,615	C	333,786	C	176,713	B
1966-67	238,858	C	338,380	C	179,146	B
1967-68	242,101	C	342,974	C	181,579	B
1968-69	245,962	C	346,834	C	185,440	B
1969-70	249,823	C	350,695	C	189,300	B
1970-71	253,684	C	354,556	C	193,160	B
1971-72	257,545	C	358,417	C	197,020	B
1972-73	261,406	C	362,279	C	200,882	B

[a] Seven packing houses operated in the area during the 1962-63 period.

[b] For capacity code see Table 27.

TABLE 66. A PROJECTION OF THE NUMBER, SIZE, AND VOLUME HANDLED OF ORANGE PACKING HOUSES IN CENTRAL CALIFORNIA FOR AREA 10, ALTERNATIVE 2, 1962-63 TO 1972-73[a]

Year	Area volume field boxes	Packing house 10B		Packing house 10C		Packing house 10F	
		Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]
1962-63	1,882,380	715,304	C	545,890	C	621,186	C
1963-64	1,919,406	728,154	C[c]	557,238	C	634,014	C
1964-65	1,936,432	728,154	C	567,891	C	640,387	C
1965-66	1,963,458	728,154	C	580,593	C	654,711	C
1966-67	1,990,484	728,154	C	593,295	C	669,035	C
1967-68	2,017,510	728,154	C	605,997	C	683,359	C
1968-69	2,044,536	728,154	C	619,510	C	696,872	C
1969-70	2,071,562	728,154	C	633,023	C	710,385	C
1970-71	2,098,588	728,154	C	646,536	C	723,898	C
1971-72	2,125,614	728,154	C	669,306	C	728,154	C[c]
1972-73	2,152,643	728,154	C	696,335	C	728,154	C

[a] Three packing houses operated in the area for 1962-63. Packing houses 10A, 10D, 10E and 10G were closed.

[b] For capacity code see Table 27.

[c] Packing houses operated at capacity indicated.

TABLE 67. A PROJECTION OF THE NUMBER, SIZE, AND VOLUME HANDLED OF ORANGE PACKING HOUSES IN CENTRAL CALIFORNIA FOR AREA 10, ALTERNATIVE 3, 1962-63 TO 1972-73[a]

		Packing house 10F	
Year	Area volume field boxes	Volume field boxes	Capacity[b]
1962-63	1,882,380	1,882,380	C - H[c]
1963-64	1,919,406	1,919,406	H
1964-65	1,936,432	1,936,432	H
1965-66	1,963,458	1,963,458	H
1966-67	1,990,484	1,990,484	H
1967-68	2,017,510	2,017,510	H
1968-69	2,044,536	2,044,536	H
1969-70	2,071,562	2,071,562	H
1970-71	2,098,588	2,098,588	H
1971-72	2,125,614	2,125,614	H
1972-73	2,152,643	2,152,643	H

[a] One packing house operated in the area for 1962-63. Packing houses 10A, 10B, 10C, 10D, 10E, and 10G were closed.

[b] For capacity code see Table 27.

[c] Packing house expanded to capacity indicated.

TABLE 68. A PROJECTION OF THE NUMBER, SIZE, AND VOLUME HANDLED OF ORANGE PACKING HOUSES IN CENTRAL CALIFORNIA FOR AREA II, ALTERNATIVE I, 1962-63 TO 1972-73[a]

		Packing house IIA		Packing house IIB (new)		Packing house IIC (new)	
Year	Area volume field boxes	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]
1962-63	386,230	386,230	C	---		---	
1963-64	785,397	728,154	C[c]	57,243	H[d]	---	
1964-65	1,184,564	728,154	C	456,410	H	---	
1965-66	1,583,731	728,154	C	855,577	H	---	
1966-67	1,982,898	728,154	C	1,254,744	H	---	
1967-68	2,382,065	728,154	C	1,653,911	H	---	
1968-69	2,781,232	728,154	C	1,941,744	H[c]	111,334	G[d]
1969-70	3,180,399	728,154	C	1,941,744	H	510,501	G
1970-71	3,579,566	728,154	C	1,941,744	H	909,668	G
1971-72	3,978,733	728,154	C	1,941,744	H	1,308,835	G
1972-73	4,377,901	728,154	C	1,941,744	H	1,708,002	G[c]

[a] One packing house operated in the area during 1962-63.

[b] For capacity code see Table 27.

[c] Packing house operated at capacity indicated.

[d] New packing house constructed with capacity indicated.

TABLE 69. A PROJECTION OF THE NUMBER, SIZE, AND VOLUME HANDLED OF ORANGE PACKING HOUSES IN CENTRAL CALIFORNIA FOR AREA II, ALTERNATIVE 2, 1962-63 TO 1972-73[a]

Year	Area volume field boxes	Packing house IIA Volume field boxes	Packing house IIA Capacity[b]	Packing house IID (new) Volume field boxes	Packing house IID (new) Capacity[b]
1962-63	386,230	386,230	C	---	
1963-64	785,397	785,397	H[c]	---	
1964-65	1,184,564	1,184,564	H	---	
1965-66	1,583,731	1,583,731	H	---	
1966-67	1,982,898	1,941,744	H[d]	41,154	H[e]
1967-68	2,382,065	1,941,744	H	440,321	H
1968-69	2,781,232	1,941,744	H	839,488	H
1969-70	3,180,399	1,941,744	H	1,238,655	H
1970-71	3,579,566	1,941,744	H	1,637,822	H
1971-72	3,978,733	1,941,744	H	2,036,989	H
1972-73	4,377,901	1,941,744	H	2,436,156	H

[a] One packing house operated in the area during 1962-63.

[b] For capacity code see Table 27.

[c] Packing house expanded to capacity indicated.

[d] Packing house operated at capacity indicated.

[e] New packing house constructed with capacity indicated.

TABLE 70. A PROJECTION OF THE NUMBER, SIZE, AND VOLUME HANDLED OF ORANGE PACKING HOUSES IN CENTRAL CALIFORNIA FOR AREA 11, ALTERNATIVE 3, 1962-63 TO 1972-73[a]

Year	Area volume field boxes	Packing house 11E (new)		Packing house 11F (new)	
		Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]
1962-63	386,230	386,230	H[c]	---	
1963-64	785,397	785,397	H	---	
1964-65	1,184,564	1,184,564	H	---	
1965-66	1,583,731	1,583,731	H	---	
1966-67	1,982,898	1,941,744	H[d]	41,154	H[c]
1967-68	2,382,065	1,941,744	H	440,321	H
1968-69	2,781,232	1,941,744	H	839,488	H
1969-70	3,180,399	1,941,744	H	1,238,655	H
1970-71	3,579,566	1,941,744	H	1,637,822	H
1971-72	3,978,733	1,941,744	H	2,036,989	H[d]
1972-73	4,377,901	1,941,744	H	2,436,156	H

[a] One packing house operated in the area during 1962-63. Packing house 11A was closed.

[b] For capacity code see Table 27.

[c] New packing house constructed with capacity indicated.

[d] Packing house operated at capacity indicated.

TABLE 71. A PROJECTION OF THE NUMBER, SIZE, AND VOLUME HANDLED OF ORANGE PACKING HOUSES IN CENTRAL CALIFORNIA FOR AREA 12, ALTERNATIVE 1, 1962-63 TO 1972-73[a]

		Packing house 12A		Packing house 12B (new)		Packing house 12C (new)	
Year	Area volume field boxes	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]
1962-63	72,696	72,697	B	---		---	
1963-64	408,156	408,156	B	---		---	
1964-65	743,616	485,436	B[c]	258,180	H[d]	---	
1965-66	1,079,076	485,436	B	593,640	H	---	
1966-67	1,414,536	485,436	B	929,100	H	---	
1967-68	1,749,996	485,436	B	1,264,560	H	---	
1968-69	2,085,456	485,436	B	1,600,020	H	---	
1969-70	2,420,916	485,436	B	1,935,480	H	---	
1970-71	2,756,376	485,436	B	1,941,744	H[c]	814,632	F[d]
1971-72	3,091,836	485,436	B	1,941,744	H	1,150,092	F
1972-73	3,427,300	485,436	B	1,941,744	H	1,485,552	F[c]

[a] One packing house operated in the area during 1962-63.

[b] For capacity code see Table 27.

[c] Packing house operated at capacity indicated.

[d] New packing house constructed with capacity indicated.

TABLE 72. A PROJECTION OF THE NUMBER, SIZE, AND VOLUME HANDLED OF ORANGE PACKING HOUSES IN CENTRAL CALIFORNIA FOR AREA 12, ALTERNATIVE 2, 1962-63 TO 1972-73[a]

		Packing house 12A		Packing house 12D (new)		Packing house 12E (new)	
Year	Area volume field boxes	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]	Volume field boxes	Capacity[b]
1962-63	72,696	72,696	B	---		---	
1963-64	408,156	408,156	B	---		---	
1964-65	743,616	743,616	B	---		---	
1965-66	1,079,076	970,872	D[c]	108,204	D[d]	---	
1966-67	1,414,536	970,872	D	443,664	D	---	
1967-68	1,749,996	970,872	D	779,124	D	---	
1968-69	2,085,456	970,872	D	970,872	D[c]	143,712	F[d]
1969-70	2,420,916	970,872	D	970,872	D	479,172	F
1970-71	2,756,376	970,872	D	970,872	D	814,632	F
1971-72	3,091,836	970,872	D	970,872	D	1,150,092	F
1972-73	3,427,300	970,872	D	970,872	D	1,485,552	F[c]

[a] One packing house operated in the area during 1962-63.

[b] For capacity code see Table 27.

[c] Packing house operated at capacity indicated.

[d] New packing house constructed with capacity indicated.

TABLE 73. A PROJECTION OF THE NUMBER, SIZE, AND VOLUME HANDLED OF ORANGE PACKING HOUSES IN CENTRAL CALIFORNIA FOR AREA 12, ALTERNATIVE 3, 1962-63 TO 1972-73[a]

Year	Area volume field boxes	Packing house 12F (new) Volume field boxes	Packing house 12F (new) Capacity[b]	Packing house 12G (new) Volume field boxes	Packing house 12G (new) Capacity[b]
1962-63	72,696	72,696	H[c]	---	
1963-64	408,156	408,156	H	---	
1964-65	743,616	743,616	H	---	
1965-66	1,079,076	1,079,076	H	---	
1966-67	1,414,536	1,414,536	H	---	
1967-68	1,749,996	1,749,996	H	---	
1968-69	2,085,456	1,941,744	H[d]	143,712	F[c]
1969-70	2,420,916	1,941,744	H	479,172	F
1970-71	2,756,376	1,941,744	H	814,632	F
1971-72	3,091,836	1,941,744	H	1,150,092	F
1972-73	3,427,300	1,941,744	H	1,485,552	F[d]

[a] One packing house operated in the area during 1962-63. Packing house 12A was closed.

[b] For capacity code see Table 27.

[c] New packing house constructed with capacity indicated.

[d] Packing house operated at capacity indicated.

APPENDIX D

EXPANSION PATH COSTS

TABLE 74. ESTIMATED TOTAL ASSEMBLY AND PACKING COSTS FOR ALL PACKING HOUSES IN AREA 1, BY ALTERNATIVES, 1962-63 TO 1972-73

Year	Assembly cost	Packing cost			Total assembly and packing cost
		Fixed	Variable	Total	
			dollars		
			Alternative 1		
1962-63	52,771	81,415	216,821	298,236	351,007
1963-64	71,060	82,848	288,739	371,607	442,667
1964-65	90,264	84,281	362,934	447,215	537,479
1965-66	106,676	287,958	430,753	718,711	825,387
1966-67	123,397	292,726	500,175	792,903	916,300
1967-68	140,573	297,498	571,548	869,046	1,009,619
1968-69	158,202	302,268	644,870	947,138	1,105,340
1969-70	176,285	307,038	720,142	1,027,180	1,203,465
1970-71	194,821	311,808	797,364	1,109,172	1,303,993
1971-72	213,811	316,578	376,536	1,193,114	1,406,925
1972-73	233,254	321,348	957,658	1,279,006	1,512,260
Total	1,561,114	2,685,768	6,367,560	9,053,328	10,614,442
			Alternative 2		
1962-63	52,771	81,415	216,821	298,236	351,007
1963-64	71,060	82,848	288,759	371,607	442,667
1964-65	90,264	84,281	362,934	447,215	537,479
1965-66	86,375	105,669	387,245	492,914	579,289
1966-67	101,888	239,874	456,553	696,427	798,315
1967-68	117,854	244,063	527,828	771,891	889,745
1968-69	134,275	248,252	601,069	849,321	983,596
1969-70	151,149	252,441	676,277	928,718	1,079,867
1970-71	168,477	256,630	753,450	1,010,080	1,178,557
1971-72	186,258	260,819	832,590	1,093,401	1,279,657
1972-73	204,492	265,008	913,697	1,178,705	1,383,197
Total	1,364,863	2,121,300	6,017,223	8,138,523	9,503,386
			Alternative 3		
1962-63	52,771	81,415	216,821	298,236	351,007
1963-64	71,060	82,848	288,759	371,607	442,667
1964-65	90,264	84,281	362,934	447,215	537,479
1965-66	86,375	229,224	379,850	609,074	695,449
1966-67	101,888	232,869	447,841	680,710	782,598
1967-68	117,855	236,514	517,761	754,275	872,130
1968-69	134,275	240,159	589,613	829,772	964,047
1969-70	151,149	243,804	663,394	907,198	1,058,347
1970-71	168,477	247,449	739,107	986,556	1,155,033
1971-72	186,258	251,094	816,750	1,067,844	1,254,102
1972-73	204,493	254,739	896,322	1,151,061	1,355,554
Total	1,364,865	2,184,396	5,919,152	8,103,548	9,468,413

TABLE 75. ESTIMATED TOTAL ASSEMBLY AND PACKING COSTS FOR ALL PACKING HOUSES IN AREA 2, BY ALTERNATIVES, 1962-63 TO 1972-73

Year	Assembly cost	Packing cost			Total assembly and packing cost
		Fixed	Variable	Total	
			dollars		
			Alternative 1		
1962-63	161,214	225,050	823,195	1,048,248	1,209,462
1963-64	197,767	229,022	997,439	1,226,461	1,424,228
1964-65	236,062	232,994	1,776,922	1,409,916	1,645,978
1965-66	276,050	236,966	1,363,179	1,600,145	1,876,195
1966-67	314,682	474,385	1,552,591	2,026,976	2,341,658
1967-68	350,072	482,069	1,728,418	2,210,487	2,560,559
1968-69	386,335	489,753	1,908,896	2,398,649	2,784,984
1969-70	423,471	497,437	2,094,027	2,591,464	3,014,935
1970-71	461,473	505,121	2,283,808	2,788,929	3,250,402
1971-72	500,362	512,805	2,478,242	2,991,047	3,491,409
1972-73	540,118	520,489	2,677,232	3,197,821	3,737,939
Total	3,847,606	4,406,091	19,084,052	23,490,143	27,337,749
			Alternative 2		
1962-63	161,214	225,050	823,198	1,082,248	1,209,462
1963-64	197,767	229,022	997,439	1,226,461	1,424,228
1964-65	236,062	232,994	1,176,922	1,409,916	1,645,978
1965-66	276,050	236,966	1,363,179	1,600,145	1,876,195
1966-67	291,750	354,022	1,530,464	1,884,486	2,176,236
1967-68	325,849	359,751	1,705,952	2,065,703	2,391,552
1968-69	360,820	365,480	1,886,090	2,251,570	2,612,390
1969-70	376,561	511,793	2,016,022	2,527,815	2,904,376
1970-71	412,310	519,776	2,204,656	2,724,432	3,136,742
1971-72	448,933	527,759	2,397,941	2,925,700	3,374,633
1972-73	486,429	535,742	2,595,880	3,131,622	3,618,051
Total	3,573,745	4,098,355	18,697,743	22,796,098	26,369,843
			Alternative 3		
1962-63	161,214	225,050	823,198	104,248	1,209,462
1963-64	197,767	229,022	997,439	1,226,461	1,424,228
1964-65	236,062	232,994	1,176,922	1,409,916	1,645,978
1965-66	276,050	236,966	1,363,179	1,600,145	1,876,195
1966-67	248,361	401,514	1,366,171	1,767,685	2,016,046
1967-68	279,941	407,908	1,539,117	1,947,025	2,226,966
1968-69	312,393	414,282	1,716,715	2,130,997	2,443,390
1969-70	345,719	656,782	1,899,021	2,555,803	2,901,522
1970-71	379,917	666,920	2,086,039	2,752,959	3,132,876
1971-72	414,989	677,058	2,277,708	2,954,766	3,369,755
1972-73	450,933	687,196	2,474,030	3,161,226	3,612,159
Total	3,303,346	4,835,692	17,719,539	22,555,231	25,858,577

TABLE 76. ESTIMATED TOTAL ASSEMBLY AND PACKING COSTS FOR ALL PACKING HOUSES IN AREA 3, BY ALTERNATIVES, 1962-63 TO 1972-73

Year	Assembly cost	Packing cost			Total assembly and packing cost
		Fixed	Variable	Total	
			dollars		
			Alternative 1		
1962-63	8,354	27,462	70,971	98,433	106,787
1963-64	22,676	27,954	190,514	218,468	241,144
1964-65	37,121	253,447	305,944	559,391	596,512
1965-66	50,289	257,516	402,071	659,587	709,876
1966-67	63,858	261,585	501,084	762,669	826,527
1967-68	77,828	265,654	602,983	868,637	946,465
1968-69	92,199	269,723	707,768	977,491	1,069,690
1969-70	106,971	273,792	815,438	1,089,230	1,196,201
1970-71	122,144	277,861	925,995	1,203,856	1,326,000
1971-72	137,718	281,930	1,039,437	1,321,367	1,459,085
1972-73	153,694	285,999	1,155,767	1,441,766	1,595,460
Total	872,852	2,482,923	6,717,972	9,200,895	10,073,747
			Alternative 2		
1962-63	8,354	27,462	70,971	98,433	106,787
1963-64	22,676	27,954	190,514	218,468	241,144
1964-65	31,359	62,382	238,819	301,201	332,560
1965-66	44,099	63,480	335,641	399,121	443,220
1966-67	57,241	64,578	435,403	499,981	557,222
1967-68	70,784	200,528	538,105	738,633	809,417
1968-69	84,728	203,999	643,746	847,745	932,473
1969-70	99,073	207,470	752,327	959,797	1,058,870
1970-71	113,819	210,941	863,848	1,074,789	1,188,608
1971-72	128,966	214,412	978,308	1,192,720	1,321,686
1972-73	144,514	217,883	1,095,708	1,313,591	1,458,105
Total	805,613	1,501,089	6,143,390	7,644,479	8,450,092
			Alternative 3		
1962-63	8,354	27,462	70,971	98,433	106,787
1963-64	22,676	27,954	190,514	218,468	241,144
1964-65	31,359	225,001	234,255	459,956	490,615
1965-66	44,099	228,579	329,231	557,810	601,909
1966-67	57,241	232,157	427,094	659,251	716,492
1967-68	70,785	235,735	527,842	763,577	834,361
1968-69	84,728	239,313	631,476	870,789	955,517
1969-70	99,073	242,891	737,997	980,888	1,079,961
1970-71	113,819	246,469	847,403	1,093,872	1,207,691
1971-72	128,966	250,047	959,695	1,209,742	1,338,708
1972-73	144,514	253,625	1,074,874	1,328,499	1,473,013
Total	805,613	2,209,233	6,031,352	8,240,585	9,046,198

TABLE 77. ESTIMATED TOTAL ASSEMBLY AND PACKING COSTS FOR ALL PACKING HOUSES IN AREA 4, BY ALTERNATIVES, 1962-63 TO 1972-73

Year	Assembly cost	Packing cost			Total assembly and packing cost
		Fixed	Variable	Total	
			dollars		
			Alternative 1		
1962-63	25,799	171,762	228,010	399,772	425,571
1963-64	37,907	174,836	331,333	506,169	544,076
1964-65	50,636	177,910	437,907	615,817	666,453
1965-66	64,084	180,984	548,436	729,420	793,504
1966-67	78,383	184,058	664,343	848,401	926,784
1967-68	93,324	187,132	783,568	970,700	1,064,024
1968-69	108,863	317,592	893,357	1,210,949	1,319,812
1969-70	122,025	322,908	992,376	1,315,284	1,437,309
1970-71	135,510	328,224	1,093,937	1,422,161	1,557,671
1971-72	149,319	333,540	1,198,041	1,531,581	1,680,900
1972-73	163,450	338,856	1,304,687	1,643,543	1,806,993
Total	1,029,300	2,717,802	8,475,995	11,193,797	12,223,097
			Alternative 2		
1962-63	25,799	171,762	228,010	399,772	425,571
1963-64	37,907	174,836	331,333	506,169	544,076
1964-65	50,636	177,910	437,907	615,817	666,453
1965-66	52,874	164,277	425,535	589,812	642,686
1966-67	63,819	176,168	513,383	680,551	744,370
1967-68	75,087	170,059	603,755	773,814	848,901
1968-69	86,679	172,950	696,653	869,602	956,282
1969-70	98,593	175,841	792,075	967,916	1,066,508
1970-71	110,831	178,732	890,021	1,068,753	1,179,584
1971-72	123,392	181,623	990,492	1,172,115	1,295,507
1972-73	136,276	184,514	1,093,487	1,278,001	1,414,277
Total	861,892	1,919,672	7,002,651	8,922,323	9,784,215
			Alternative 3		
1962-63	25,799	171,762	228,110	399,772	425,571
1963-64	37,907	174,832	331,333	506,169	544,076
1964-65	50,636	177,910	437,907	615,817	666,453
1965-66	52,874	229,224	417,409	646,633	699,507
1966-67	63,819	232,869	503,585	736,454	800,273
1967-68	75,087	236,514	592,241	828,755	903,842
1968-69	86,679	240,159	683,374	923,533	1,010,212
1969-70	98,593	243,804	765,062	1,008,866	1,107,459
1970-71	110,831	247,449	873,077	1,120,526	1,231,357
1971-72	123,392	251,094	971,646	1,222,740	1,346,132
1972-73	136,275	254,739	1,072,692	1,327,431	1,463,706
Total	861,892	2,460,360	6,876,336	9,336,697	10,198,588

TABLE 78. ESTIMATED TOTAL ASSEMBLY AND PACKING COSTS FOR ALL PACKING HOUSES IN AREA 5, BY ALTERNATIVES, 1962-63 TO 1972-73

Year	Assembly cost	Packing cost			Total assembly and packing cost
		Fixed	Variable	Total	
			dollars		
			Alternative 1		
1962-63	134,632	385,588	959,312	1,344,900	1,479,532
1963-64	153,721	392,404	1,083,269	1,475,673	1,629,394
1964-65	173,647	399,220	1,212,960	1,612,180	1,785,827
1965-66	194,307	406,036	1,348,631	1,754,667	1,948,974
1966-67	215,717	412,852	1,489,751	1,902,603	2,118,320
1967-68	238,173	419,668	1,627,896	2,047,564	2,285,737
1968-69	251,485	462,772	1,691,491	2,154,213	2,405,698
1969-70	268,372	506,613	1,773,893	2,280,506	2,548,878
1970-71	287,987	514,880	1,905,761	2,420,641	2,708,628
1971-72	308,022	523,147	2,040,721	2,563,868	2,871,890
1972-73	328,477	531,414	2,178,771	2,710,185	3,038,662
Total	2,554,540	4,954,544	17,312,456	22,267,000	24,821,540
			Alternative 2		
1962-63	134,997	241,574	952,246	1,166,820	1,301,817
1963-64	154,108	245,839	1,045,273	1,291,112	1,445,220
1964-65	144,821	487,620	1,118,893	1,606,513	1,751,334
1965-66	160,384	495,439	1,232,421	1,727,860	1,888,244
1966-67	176,368	503,258	1,348,973	1,852,231	2,028,599
1967-68	192,771	511,077	1,468,548	1,979,625	2,172,396
1968-69	209,594	518,896	1,591,145	2,110,041	2,319,635
1969-70	226,838	526,715	1,716,766	2,243,481	2,470,319
1970-71	244,998	534,534	1,845,409	2,379,943	2,624,941
1971-72	262,585	542,353	1,977,076	2,519,429	2,782,014
1972-73	281,089	550,172	2,111,768	2,661,940	2,943,029
Total	2,188,553	5,157,477	16,381,518	21,538,995	23,727,548
			Alternative 3		
1962-63	134,997	241,574	925,246	1,166,820	1,301,817
1963-64	154,108	245,839	1,045,273	1,291,112	1,445,220
1964-65	139,049	450.002	1,036,936	1,486,938	1,625,987
1965-66	154,185	457,156	1,149,150	1,606,306	1,760,491
1966-67	169,741	464,310	1,264,386	1,728,696	1,898,437
1967-68	185,718	471,464	1,382,645	1,854,109	2,039,827
1968-69	202,114	478,618	1,503,927	1,982,545	2,184,659
1969-70	218,930	485,772	1,628,232	2,114,004	2,332,934
1970-71	236,167	492,926	1,755,560	2,248,486	2,484,653
1971-72	253,823	500,080	1,885,911	2,385,991	2,639,814
1972-73	271,900	507,234	2,019,287	2,526,521	2,798,421
Total	2,120,732	4,794,975	15,596,553	20,391,528	22,512,260

TABLE 79. ESTIMATED TOTAL ASSEMBLY AND PACKING COSTS FOR ALL PACKING HOUSES IN AREA 6, BY ALTERNATIVES, 1962-63 TO 1972-73

Year	Assembly cost	Packing cost			Total assembly and packing cost
		Fixed	Variable	Total	
			dollars		
			Alternative 1		
1962-63	18,558	145,661	185,249	330,910	349,468
1963-64	27,718	148,269	274,342	422,611	450,329
1964-65	37,348	150,877	371,334	522,211	559,559
1965-66	45,573	204,085	436,058	640,143	685,716
1966-67	54,846	207,609	509,470	717,079	771,925
1967-68	64,385	211,133	584,952	796,085	860,470
1968-69	74,188	214,657	662,504	877,161	951,349
1969-70	84,257	218,181	742,127	960,308	1,044,565
1970-71	92,074	258,713	768,625	1,027,338	1,119,412
1971-72	102,502	262,992	852,110	1,115,102	1,217,604
1972-73	113,196	267,271	937,679	1,204,950	1,318,146
Total	714,645	2,289,448	6,324,450	8,613,898	9,328,543
			Alternative 2		
1962-63	18,558	86,407	187,876	274,283	292,841
1963-64	27,718	87,954	278,383	366,337	394,055
1964-65	35,066	145,221	300,056	445,277	480,343
1965-66	42,238	198,363	340,971	539,334	581,572
1966-67	51,171	201,821	412,878	614,699	665,870
1967-68	60,370	205,279	486,855	692,134	752,504
1968-69	69,834	208,737	562,903	771,640	841,474
1969-70	79,563	212,195	641,020	853,215	932,778
1970-71	89,557	215,653	721,208	936,861	1,026,418
1971-72	99,815	219,111	803,465	1,022,576	1,122,391
1972-73	110,339	222,569	887,794	1,110,363	1,220,072
Total	684,229	2,003,310	5,623,409	7,626,719	8,310,948
			Alternative 3		
1962-63	18,558	145,661	185,249	330,910	349,468
1963-64	27,718	148,269	274,342	422,611	450,329
1964-65	37,348	150,877	371,334	522,211	559,559
1965-66	42,238	219,912	334,425	554,637	596,875
1966-67	51,171	233,409	405,315	628,724	679,895
1967-68	60,370	226,906	477,937	704,843	765,213
1968-69	69,834	230,403	552,592	782,995	852,829
1969-70	79,563	233,900	629,279	863,179	942,742
1970-71	89,557	237,397	707,998	945,395	1,034,952
1971-72	99,815	240,894	788,749	1,029,643	1,129,458
1972-73	110,339	244,391	871,533	1,115,924	1,226,263
Total	686,511	2,302,019	5,599,053	7,901,072	8,587,583

TABLE80. ESTIMATED TOTAL ASSEMBLY AND PACKING COSTS FOR ALL PACKING HOUSES IN AREA 7, BY ALTERNATIVES, 1962-63 TO 1972-73

Year	Assembly cost	Packing cost			Total assembly and packing cost
		Fixed	Variable	Total	
			dollars		
			Alternative 1		
1962-63	94,519	269,759	811,714	1,081,473	1,175,992
1963-64	99,285	274,532	847,565	1,122,097	1,221,382
1964-65	104,146	279,305	884,147	1,163,452	1,267,598
1965-66	109,146	284,078	922,148	1,206,226	1,315,372
1966-67	114,779	288,851	968,469	1,257,320	1,372,099
1967-68	120,505	293,624	1,015,075	1,308,699	1,429,204
1968-69	126,431	298,397	1,063,005	1,361,402	1,487,833
1969-70	132,522	303,170	1,111,913	1,415,083	1,547,605
1970-71	138,777	307,943	1,161,799	1,469,742	1,608,519
1971-72	145,198	312,716	1,212,662	1,525,378	1,670,576
1972-73	151,782	317,489	1,264,505	1,581,994	1,733,776
Total	1,337,090	3,229,864	11,263,002	14,492,866	15,829,956
			Alternative 2		
1962-63	93,660	182,993	795,941	978,934	1,072,594
1963-64	88,764	205,398	750,360	955,758	1,044,522
1964-65	92,853	208,978	784,292	993,270	1,086,123
1965-66	97,027	212,558	818,921	1,031,479	1,128,506
1966-67	101,288	215,138	854,246	1,070,384	1,171,672
1967-68	105,636	219,718	890,277	1,109,995	1,215,631
1968-69	110,068	223,298	926,986	1,150,284	1,260,352
1969-70	114,588	226,878	964,401	1,191,279	1,305,867
1970-71	119,193	230,458	1,002,512	1,232,970	1,352,163
1971-72	123,885	234,038	1,041,319	1,275,357	1,399,242
1972-73	128,663	237,618	1,080,824	1,318,442	1,447,105
Total	1,175,625	2,398,073	9,910,079	12,308,152	13,483,777
			Alternative 3		
1962-63	84,762	216,555	699,467	916,022	1,000,784
1963-64	88,764	219,998	732,010	952,008	1,040,772
1964-65	92,853	223,441	765,238	988,679	1,081,532
1965-66	97,072	226,884	799,149	1,026,033	1,123,060
1966-67	101,288	230,327	833,743	1,064,070	1,165,358
1967-68	105,635	233,770	869,022	1,102,792	1,208,427
1968-69	110,068	237,213	904,984	1,142,197	1,252,265
1969-70	114,588	240,656	941,630	1,182,286	1,296,874
1970-71	119,193	244,099	978,960	1,223,059	1,342,252
1971-72	123,885	247,542	1,016,973	1,264,515	1,388,400
1972-73	128,663	250,985	1,055,673	1,306,658	1,435,321
Total	1,166,726	2,571,470	9,596,849	12,168,319	13,335,045

TABLE 81. ESTIMATED TOTAL ASSEMBLY AND PACKING COSTS FOR ALL PACKING HOUSES IN AREA 8, BY ALTERNATIVES, 1962-63 TO 1972-73

Year	Assembly cost	Packing cost			Total assembly and packing cost
		Fixed	Variable	Total	
			dollars		
			Alternative 1		
1962-63	297,800	864,634	2,244,936	3,109,570	3,407,370
1963-64	295,777	879,889	2,209,727	3,089,616	3,385,393
1964-65	293,258	895,144	2,171,639	3,066,783	3,360,041
1965-66	290,231	910,399	2,131,310	3,041,709	3,331,940
1966-67	286,709	925,654	2,088,845	3,014,499	3,301,208
1967-68	282,759	940,909	2,043,886	2,984,795	3,267,554
1968-69	278,326	956,164	1,991,189	2,947,353	3,225,679
1969-70	273,397	971,419	1,935,959	2,907,378	3,180,775
1970-71	267,971	986,674	1,878,190	2,864,864	3,132,835
1971-72	262,047	1,001,929	1,817,884	2,819,813	3,081,860
1972-73	255,627	1,017,214	1,755,040	2,772,254	3,027,881
Total	3,083,902	10,350,029	22,268,605	32,618,634	35,702,536
			Alternative 2		
1962-63	293,601	513,759	2,118,556	2,632,315	2,925,916
1963-64	291,161	522,801	2,084,804	2,607,605	2,898,766
1964-65	288,233	531,843	2,048,801	2,580,644	2,868,877
1965-66	284,917	540,885	2,010,712	2,551,597	2,836,514
1966-67	281,229	549,927	1,970,543	2,520,470	2,801,699
1967-68	277,076	558,969	1,928,129	2,487,098	2,764,174
1968-69	272,460	568,011	1,883,479	2,451,490	2,723,950
1969-70	267,381	576,753	1,836,587	2,413,340	2,680,721
1970-71	261,837	586,095	1,787,452	2,373,547	2,635,384
1971-72	255,829	595,137	1,736,080	2,331,217	2,587,046
1972-73	249,358	604,179	1,682,467	2,286,646	2,536,004
Total	3,023,082	6,148,359	21,087,610	27,235,969	30,259,051
			Alternative 3		
1962-63	293,601	513,759	2,118,556	2,632,315	2,925,916
1963-64	291,161	522,801	2,084,804	2,607,605	2,898,766
1964-65	288,233	531,943	2,048,801	2,580,744	2,868,977
1965-66	284,917	540,885	2,010,712	2,551,597	2,836,514
1966-67	281,229	549,927	1,970,543	2,520,470	2,801,699
1967-68	277,076	558,969	1,928,129	2,487,098	2,764,174
1968-69	225,624	424,784	1,775,619	2,200,403	2,426,027
1969-70	220,127	431,538	1,731,403	2,162,941	2,383,068
1970-71	214,352	438,292	1,685,075	2,123,367	2,337,719
1971-72	208,299	445,046	1,636,636	2,081,682	2,289,981
1972-73	201,968	451,800	1,586,086	2,037,886	2,239,854
Total	2,786,587	5,409,744	20,576,364	25,986,108	28,772,695

TABLE 82, ESTIMATED TOTAL ASSEMBLY AND PACKING COSTS FOR ALL PACKING HOUSES IN AREA 9, BY ALTERNATIVES, 1962-63 TO 1972-73

Year	Assembly cost	Packing cost			Total assembly and packing cost
		Fixed	Variable	Total	
			dollars		
			Alternative 1		
1962-63	99,642	358,252	814,468	1,173,120	1,272,762
1963-64	117,118	364,557	947,302	1,311,859	1,428,977
1964-65	135,392	370,862	1,083,618	1,454,480	1,589,872
1965-66	154,462	377,167	1,223,816	1,600,983	1,755,445
1966-67	174,329	383,472	1,367,902	1,751,374	1,925,703
1967-68	194,993	389,777	1,524,242	1,914,019	2,109,012
1968-69	216,453	396,082	1,684,722	2,080,804	2,297,257
1969-70	242,345	402,387	1,880,081	2,282,468	2,524,813
1970-71	265,486	408,692	2,052,521	2,461,213	2,726,699
1971-72	289,421	414,997	2,228,526	2,643,523	2,932,944
1972-73	314,154	421,302	2,410,077	2,831,379	3,145,533
Total	2,203,795	4,287,547	17,217,675	21,505,222	23,709,017
			Alternative 2		
1962-63	99,642	244,319	758,928	1,003,247	1,102,889
1963-64	117,118	248,619	882,269	1,130,888	1,248,006
1964-65	120,618	361,911	968,826	1,330,737	1,451,355
1965-66	137,002	367,805	1,094,181	1,461,986	1,598,988
1966-67	142,232	394,039	1,165,550	1,559,589	1,701,821
1967-68	158,003	400,382	1,291,632	1,692,014	1,850,017
1968-69	174,850	406,725	1,422,188	1,828,913	2,003,763
1969-70	192,601	413,008	1,556,550	1,969,558	2,162,159
1970-71	196,340	441,291	1,676,876	2,118,167	2,314,507
1971-72	212,631	448,140	1,815,458	2,263,598	2,476,229
1972-73	229,308	454,989	1,957,331	2,412,320	2,641,628
Total	1,780,345	4,181,228	14,589,789	18,771,017	20,551,362
			Alternative 3		
1962-63	90,386	338,155	712,545	1,050,700	1,141,086
1963-64	105,768	343,738	828,351	1,170,289	1,777,857
1964-65	106,981	468,313	907,151	1,375,464	1,482,445
1965-66	120,885	464,490	1,024,529	1,490,019	1,610,904
1966-67	135,186	472,667	1,145,160	1,617,827	1,753,013
1967-68	149,883	479,844	1,269,042	1,748,886	1,898,769
1968-69	164,976	487,021	1,396,177	1,883,198	2,048,174
1969-70	180,465	494,198	1,526,565	2,020,763	2,201,228
1970-71	196,350	501,375	1,660,205	2,161,580	2,357,930
1971-72	212,631	508,552	1,797,098	2,305,650	2,518,281
1972-73	229,308	515,729	1,937,240	2,452,969	2,682,777
Total	1,692,819	5,075,082	14,204,063	19,779,145	20,971,964

TABLE 83. ESTIMATED TOTAL ASSEMBLY AND PACKING COSTS FOR ALL PACKING HOUSES IN AREA 10, BY ALTERNATIVES, 1962-63 TO 1972-73

Year	Assembly cost	Packing cost			Total assembly and packing cost
		Fixed	Variable	Total	
			dollars		
			Alternative 1		
1962-63	133,775	409,422	972,385	1,381,807	1,515,582
1963-64	139,341	416,677	1,002,723	1,419,400	1,558,741
1964-65	145,010	423,932	1,033,524	1,457,456	1,602,466
1965-66	150,783	431,187	1,064,788	1,495,975	1,646,658
1966-67	156,658	438,442	1,096,668	1,535,060	1,691,718
1967-68	162,637	445,697	1,128,708	1,574,405	1,737,042
1968-69	168,699	452,952	1,161,495	1,614,447	1,783,146
1969-70	174,862	460,207	1,194,748	1,654,955	1,829,817
1970-71	181,127	467,462	1,228,470	1,695,932	1,877,059
1971-72	187,493	474,717	1,262,659	1,737,376	1,924,869
1972-73	193,961	481,972	1,297,317	1,779,289	1,973,250
Total	1.794,346	4,902,667	12,443,435	17,346,102	19,140,448
			Alternative 2		
1962-63	139,447	191,083	918,135	1,109,218	1,248,665
1963-64	146,163	194,446	951,670	1,146,116	1,292,279
1964-65	151,468	197,809	975,585	1,173,394	1,324,862
1965-66	157,646	201,172	1,004,485	1,205,657	1,363,303
1966-67	163,936	204,535	1,033,802	1,238,337	1,402,273
1967-68	173,251	270,898	1,063,538	1,271,436	1,444,687
1968-69	176,852	211,261	1,093,749	1,305,010	1,481,862
1969-70	183,478	214,624	1,124,380	1,339,004	1,522,482
1970-71	190,224	217,987	1,155,476	1,373,463	1,563,687
1971-72	197,066	221,350	1,187,579	1,408,929	1,605,995
1972-73	204,028	224,713	1,220,485	1,445,198	1,649,225
Total	1,883,559	2,286,878	11,728,884	14,015,762	15,899,321
			Alternative 3		
1962-63	108,869	216,555	765,010	982,465	1,091,334
1963-64	116,642	219,998	820,085	1,040,083	1,156,725
1964-65	119,672	223,441	840,876	1,064,317	1,183,989
1965-66	123,364	226,884	866,317	1,093,201	1,216,565
1966-67	127,112	230,327	892,135	1,122,462	1,249,574
1967-68	130,916	233,770	918,330	1,152,100	1,283,016
1968-69	134,776	237,213	944,903	1,182,116	1,316,892
1969-70	138,691	240,656	971,853	1,212,509	1,351,200
1970-71	142,662	244,099	999,180	1,243,279	1,385,941
1971-72	146,689	247,542	1,026,884	1,474,426	1,421,115
1972-73	150,771	250,985	1,054,967	1,305,952	1,456,723
Total	1,440,164	2,571,470	10,101,440	12,672,910	14,113,074

TABLE 84. ESTIMATED TOTAL ASSEMBLY AND PACKING COSTS FOR ALL PACKING HOUSES IN AREA 11, BY ALTERNATIVES, 1962-63 TO 1972-73

Year	Assembly cost	Packing cost			Total assembly and packing cost
		Fixed	Variable	Total	
			dollars		
			Alternative 1		
1962-63	24,931	67,436	228,749	296,185	321,116
1963-64	51,345	289,401	462,872	752,273	803,618
1964-65	74,206	294,098	643,763	937,861	1,012,067
1965-66	97,786	298,795	830,227	1,129,022	1,226,808
1966-67	122,084	303,492	1,022,264	1,325,756	1,447,840
1967-68	147,101	308,189	1,219,872	1,528,061	1,675,162
1968-69	172,836	544,951	1,423,093	1,968,044	2,140,880
1969-70	199,290	553,338	1,631,986	2,185,324	2,384,614
1970-71	226,462	561,725	1,846,451	2,408,176	2,634,638
1971-72	254,353	570,112	2,066,489	2,636,601	2,890,954
1972-73	282,963	578,499	2,292,099	2,870,598	3,153,561
Total	1,653,357	4,370,036	13,667,865	18,037,901	19,691,258
			Alternative 2		
1962-63	24,931	67,436	228,749	296,185	321,116
1963-64	41,595	194,735	335,569	530,304	571,899
1964-65	63,801	197,831	514,385	712,216	776,017
1965-66	86,725	200,927	698,774	899,701	986,426
1966-67	110,368	437,470	888,735	1,326,205	1,436,573
1967-68	134,730	444,278	1,084,268	1,528,546	1,663,276
1968-69	159,810	451,086	1,285,374	1,736,460	1,896,270
1969-70	185,608	457,894	1,492,052	1,949,946	2,135,554
1970-71	212,125	464,702	1,704,303	2,169,005	2,381,130
1971-72	239,361	471,510	1,922,126	2,393,636	2,632,997
1972-73	267,315	478,318	2,145,521	2,623,839	2,891,154
Total	1,526,369	3,866,187	12,299,856	16,166,043	17,692,412
			Alternative 3		
1962-63	20,107	216,555	162,325	378,880	398,987
1963-64	41,595	219,998	335,569	555,567	597,162
1964-65	63,801	223,441	514,385	737,826	801,627
1965-66	86,725	226,884	698,774	925,658	1,012,383
1966-67	110,368	463,774	888,735	1,352,509	1,462,877
1967-68	134,730	470,929	1,084,268	1,555,197	1,689,927
1968-69	159,810	478,084	1,285,374	1,763,458	1,923,268
1969-70	185,608	485,239	1,492,052	1,977,291	2,162,899
1970-71	212,125	492,394	1,704,303	2,196,697	2,408,822
1971-72	239,361	499,549	1,922,126	2,421,675	2,661,036
1972-73	267,315	506,702	2,145,521	2,652,225	2,919,540
Total	1,521,545	4,283,551	12,233,432	16,516,983	18,038,528

TABLE 85. ESTIMATED TOTAL ASSEMBLY AND PACKING COSTS FOR ALL PACKING HOUSES IN AREA 12, BY ALTERNATIVES, 1962-63 TO 1972-73

Year	Assembly cost	Packing cost			Total assembly and packing cost
		Fixed	Variable	Total	
			dollars		
			Alternative 1		
1962-63	7,517	24,432	47,188	73,620	81,137
1963-64	43,379	26,905	269,334	296,239	339,618
1964-65	76,394	252,379	437,670	690,049	766,443
1965-66	109,098	256,429	592,712	849,141	958,239
1966-67	142,815	260,479	752,437	1,012,916	1,155,731
1967-68	177,545	264,529	916,845	1,181,374	1,358,919
1968-69	213,288	268,579	1,085,935	1,354,514	1,567,802
1969-70	250,045	272,629	1,259,709	1,532,238	1,782,383
1970-71	336,217	508,373	1,669,895	2,178,258	2,514,485
1971-72	375,732	516,246	1,856,683	2,372,929	2,748,661
1972-73	416,261	523,119	2,048,161	2,572,280	2,988,541
Total	2,148,291	3,177,099	10,936,569	14,113,668	16,261,959
			Alternative 2		
1962-63	7,517	26,432	47,188	73,620	81,137
1963-64	43,379	26,905	269,334	296,239	339,618
1964-65	81,173	27,378	498,706	526,884	607,257
1965-66	99,448	192,293	485,379	677,672	777,120
1966-67	132,500	195,677	646,330	842,007	974,507
1967-68	166,565	199,061	812,051	1,011,112	1,177,677
1968-69	201,643	426,115	981,355	1,407,470	1,609,113
1969-70	237,734	433,189	1,153,788	1,586,977	1,824,711
1970-71	274,838	440,263	1,330,910	1,771,173	2,046,011
1971-72	312,956	447,337	1,512,723	1,960,060	2,273,016
1972-73	352,086	454,411	1,699,225	2,153,636	2,505,722
Total	1,909,839	2,869,061	9,436,989	12,306,050	14,215,889
			Alternative 3		
1962-63	6,370	216,555	30,553	247,108	253,478
1963-64	36,383	219,998	174,389	394,387	430,770
1964-65	67,409	223,441	322,908	546,349	613,758
1965-66	99,448	226,884	476,100	702,994	802,442
1966-67	132,500	230,327	633,995	864,322	996,822
1967-68	166,565	233,770	796,563	1,030,333	1,196,898
1968-69	201,643	460,883	963,918	1,424,801	1,626,444
1969-70	237,734	468,017	1,136,098	1,604,115	1,841,849
1970-71	274,838	475,151	1,312,969	1,788,120	2,062,958
1971-72	312,956	482,285	1,494,529	1,976,814	2,289,770
1972-73	352,086	489,419	1,680,778	2,170,197	2,522,283
Total	1,887,932	3,726,730	9,022,810	12,749,540	14,637,472

BIOGRAPHICAL SKETCH

Robert Conrad Rock was born November 24, 1917, at San Diego, California. He graduated from Point Loma High School in 1936 and attended San Diego State College during the 1936-37 year. In January, 1940 he entered the University of California at Berkeley and received the B.S. degree with a major in Agricultural Economics from that institution in June, 1943. From 1943 until 1946 he served in the United States Navy in the Pacific Theater of operations. Following his discharge from the Navy, he returned to the University of California at Berkeley and received the M.S. degree with a major in Agricultural Economics in June, 1948. He joined the California Agricultural Extension Service in July, 1948, as an Assistant Agriculturist, Extension Economist. He has held this position since then and has advanced to the rank of Agriculturist, Extension Economist. In 1962, on sabbatical leave from the University of California, he entered the University of Florida Graduate School for work towards the Ph.D. degree, with a major in Agricultural Economics and a minor in Economics.

Robert Conrad Rock is married to the former Joy Louise Harris and is the father of one daughter. He is a member of Alpha Zeta, Gamma Sigma Delta, American Farm Economic Association, Western Farm Economic Association, and the California Valencia Orange Administrative Committee.

This dissertation was prepared under the direction of the chairman of the candidate's supervisory committee and has been approved by all members of that committee. It was submitted to the Dean of the College of Agriculture and to the Graduate Council, and was approved as a partial fulfillment of the requirements for the degree of Doctor of Philosophy.

August 14, 1965

Dean, College of Agriculture

Dean, Graduate School

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